

# LFI-10

*Digital Audio Format Interface*

**lexicon**

## Unpacking and Inspection

After unpacking the LFI-10, save all packing materials in case you ever need to ship the unit. Thoroughly inspect the unit and packing materials for signs of damage. Report any shipment damage to the carrier at once; report equipment malfunction to your dealer.

## Precautions

Save these instructions for later use.

Follow all instructions and warnings marked on the unit.

Always use with the correct line voltage. Refer to the manufacturer's operating instructions for power requirements. Be advised that different operating voltages may require the use of a different line cord and/or attachment plug.

Do not install the unit in an unventilated rack, or directly above heat producing equipment such as power amplifiers. Observe the maximum ambient operating temperature listed in the product specification.

Slots and openings on the case are provided for ventilation; to ensure reliable operation and prevent it from overheating, these openings must not be blocked or covered. Never push objects of any kind through any of the ventilation slots. Never spill a liquid of any kind on the unit.

This product is equipped with a 3-wire grounding type plug. This is a safety feature and should not be defeated.

Never attach audio power amplifier outputs directly to any of the unit's connectors.

To prevent shock or fire hazard, do not expose the unit to rain or moisture, or operate it where it will be exposed to water.

Do not attempt to operate the unit if it has been dropped, damaged, exposed to liquids, or if it exhibits a distinct change in performance indicating the need for service.

This unit should only be opened by qualified service personnel. Removing covers will expose you to hazardous voltages.

This triangle, which appears on your component, alerts you to the presence of uninsulated, dangerous voltage inside the enclosure... voltage that may be sufficient to constitute a risk of shock.



This triangle, which appears on your component, alerts you to important operating and maintenance instructions in this accompanying literature.

## Notice

This equipment generates and uses radio frequency energy and if not installed and used properly, that is, in strict accordance with the manufacturer's instructions, may cause interference to radio and television reception. It has been type tested and found to comply with the limits for a Class A computing device in accordance with the specifications in Subpart J of Part 15 of FCC Rules, which are designated to provide reasonable protection against such interference in a residential installation. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment OFF and ON, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient the receiving antenna
- Relocate the computer with respect to the receiver
- Move the computer away from the receiver
- Plug the computer into a different outlet so that the computer and receiver are on different branch circuits.

If necessary, the user should consult the dealer or an experienced radio/television technician for additional suggestions. The user may find the following booklet prepared by the Federal Communications Commission helpful:

"How to Identify and Resolve Radio/TV Interference Problems."

This booklet is available from the U.S. Government Printing Office, Washington, DC 20402, Stock No. 004-000-00345-4.

Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de la classe B prescrites dans le Règlement sur le brouillage radioélectrique édicté par le ministère des Communications du Canada.

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Lexicon Part # 070-08618 Rev 1

Printed in the United States of America

Dansk

Vigtig information om sikkerhed

Gem denne vejledning til senere brug.

Følg alle anvisninger og advarsler på apparatet.

Apparatet skal altid tilsluttes den korrekte spænding. Der henvises til brugsanvisningen, der indeholder specifikationer for strømforsyning. Der gøres opmærksom på, at ved varierende driftsspændinger kan det blive nødvendigt at bruge andre lednings- og/eller stiktyper.

Apparatet må ikke monteres i et kabinet uden ventilation eller lige over andet udstyr, der udvikler varme, f.eks. forstærkere. Den maksimale omgivelsestemperatur ved drift, der står opført i specifikationerne, skal overholdes.

Der er ventilationsåbninger i kabinettet. For at sikre apparatets drift og hindre overophedning må disse åbninger ikke blokeres eller tildækkes. Stik aldrig noget ind igennem ventilationsåbningerne, og pas på aldrig at spilde nogen form for væske på apparatet.

Dette apparat er forsynet med et stik med jordforbindelse. Denne sikkerhedsforanstaltning må aldrig omgås.

Udgangsstik fra audioforstærkere må aldrig sættes direkte i apparatet.

Apparatet må ikke udsættes for regn eller fugt og må ikke bruges i nærheden af vand for at undgå risiko for elektrisk stød og brand.

Apparatet må aldrig bruges, hvis det er blevet stødt, beskadiget eller vådt, eller hvis ændringer i ydelsen tyder på, at det trænger til eftersyn.

Dette apparat må kun åbnes af fagfolk. Hvis dækslet tages af, udsættes man for livsfarlig højspænding.



Denne mærkat på komponenten advarer om uisoleret, farlig spænding i apparatet ... høj nok til at give elektrisk stød.



Denne mærkat på komponenten advarer om vigtig drifts- og vedligeholdelsesinformation i den tilhørende litteratur.

Suomi

Tärkeitä turvallisuusohjeita

Säilytä nämä ohjeet tulevaa käyttöä varten.

Seuraa kaikkia yksikköön merkittyjä ohjeita ja varoituksia.

Käytä aina oikeaa verkkojännitettä. Tehovaatimukset selviävät valmistajan käyttöohjeista. Huomaa, että eri käyttöjännitteet saattavat vaatia toisenlaisen verkkojohdon ja/tai -pistokkeen käytön.

Älä asenna yksikköä telineeseen jossa ei ole tuuletusta, tai välittömästi lämpöä tuottavien laitteiden, esim. tehovahvistimien, yläpuolelle. Ympäristön lämpötila käytössä ei saa ylittää tuotespesifikaation maksimilämpötilaa.

Kotelo on varustettu tuuletusreiillä ja -aukoilla. Luotettavan toiminnan varmistamiseksi ja ylläpönnemisen välttämiseksi näitä aukkoja ei saa sulkea tai peittää. Mitään esineitä ei saa työntää tuuletusaukkoihin. Mitään nesteitä ei saa kaataa yksikköön.

Tuote on varustettu 3-johtimisella maadoitetulla verkkopistokkeella. Tämä on turvallisuustoiminne eikä sitä saa poistaa.

Älä kytke audiotehovahvistimen lähtöjä suoraan mihinkään yksikön liittimeen.

Sähköiskun ja palovaaran välttämiseksi yksikkö ei saa olla sateessa tai kosteassa, eikä sitä saa käyttää määrässä ympäristössä.

Älä käytä yksikköä jos se on pudonnut, vaurioitunut, kostunut, tai jos sen suorituskyky on huomattavasti muuttunut, mikä vaatii huoltoa.

Yksikön saa avata vain laitteeseen perehtynyt huoltohenkilö. Kansien poisto altistaa sinut vaarallisille jännitteille.



Tämä kolmio, joka esiintyy komponentissasi, varoittaa sinua enistämättömän vaarallisen jännitteen esiintymisestä yksikön sisällä. Tämä jännite saattaa olla riittävän korkea aiheuttamaan sähköiskuvaaran.



Tämä kolmio, joka esiintyy komponentissasi, kertoo sinulle, että tässä tuotedokumentoinnissa esiintyy tärkeitä käyttö- ja ylläpito-ohjeita.

Norsk

Viktig informasjon om sikkerhet

Ta vare på denne veiledningen for senere bruk.

Følg alle anvisningene og advarslene som er angitt på apparatet.

Apparatet skal alltid anvendes med korrekt spenning. Produktbeskrivelsen inneholder spesifikasjoner for strømkrav. Vær oppmerksom på at det ved ulike driftsspenninger kan være nødvendig å bruke en annen ledning- og/eller støpseltype.

Apparatet skal ikke monteres i skap uten ventilasjon, eller direkte over varmeproduiserende utstyr, som for eksempel kraftforstærkere. Den maksimale romtemperaturen som står oppgitt i produktbeskrivelsen, skal overholdes.

Apparatet er utstyrt med ventilasjonsåpninger. For at apparatet skal være pålitelig i bruk og ikke overopphetes, må disse åpningene ikke blokeres eller tildekkes. Stikk aldri noe inn i ventilasjonsåpningene, og pass på at det aldri søles noen form for væske på apparatet.

Dette apparatet er utstyrt med et jordet støpsel. Dette er en sikkerhetsforanstaltning som ikke må forandres.

Utgangsplugger fra audioforstærkere skal aldri koples direkte til apparatet.

Unngå brannfare og elektrisk støt ved å sørge for at apparatet ikke utsettes for regn eller fuktighet og ikke anvendes i nærheten av vann.

Apparatet skal ikke brukes hvis det har blitt utsatt for støt, er skadet eller blitt vått, eller hvis endringer i ytelsen tyder på at det trenger service.

Dette apparatet skal kun åpnes av fagfolk. Hvis dekslet fjernes, utsettes man for livsfarlig høyspenning.



Komponenten er merket med denne trekanten, som er en advarsel om at det finnes uisolert, farlig spenning inne i kabinettet ... høy nok til å utgjøre en fare for elektrisk støt.



Komponenten er merket med denne trekanten, som betyr at den tilhørende litteraturen inneholder viktige opplysninger om drift og vedlikehold.

Svenska

Viktiga säkerhetsföreskrifter

Spara dessa föreskrifter för framtida bruk.

Följ alla anvisningar och varningar som anges på enheten.

Använd alltid rätt nätspänning. Se tillverkarens bruksanvisningar för information om effektkrav. Märkväl, att andra matningsspänningar eventuellt kräver att en annan typs nätsladd och/eller kontakt används.

Installera inte enheten i ett oventilerat stativ, eller direkt ovanför utrustningar som avger värme, t ex effektförstärkare. Se till att omgivningens temperatur vid drift inte överskrider det angivna värdet i produktspecifikationen.

Behållaren är försedd med hål och öppningar för ventiler. För att garantera tillförlitlig funktion och förhindra överhettning får dessa öppningar inte blockeras eller täckas. Inga föremål får skuffas in genom ventilationshålen. Inga vätskor får spillas på enheten.

Produkten är försedd med en jordad 3-trådskontakt. Detta är en säkerhetsfunktion som inte får tas ur bruk.

Anslut aldrig audioeffektförstärkarutgångar direkt till någon av enhetens kontakter.

För att undvika elstöt eller brandfara får enheten inte utsättas för regn eller fukt, eller användas på ställen där den blir våt.

Använd inte enheten om den har fallit i golvet, skadats, blivit våt, eller om dess prestanda förändrats märkbart, vilket kräver service.

Enheten får öppnas endast av behörig servicepersonal. Farliga spänningar blir tillgängliga när locken tas bort.



Denna triangel, som visas på din komponent, varnar dig om en oisolerad farlig spänning inne i enheten. Denna spänning är eventuellt så hög att fara för elstöt föreligger.



Denna triangel, som visas på din komponent, anger att viktiga bruksanvisningar och serviceanvisningar ingår i dokumentationen i fråga.



Deutsch  
**Wichtige Sicherheitsanweisungen**

Heben Sie sich diese Sicherheitsanweisungen auch für später auf.  
Befolgen Sie alle auf der Vorrichtung stehenden Anweisungen und Warnungen.  
Immer nur mit der richtigen Spannung verwenden! Die Gebrauchsanweisungen des Herstellers informieren Sie über die elektrischen Anforderungen. Vergessen Sie nicht daß bei verschiedenen Betriebsspannungen ggf. auch verschiedene Leitungskabel und/oder Verbindungsstecker zu verwenden sind.  
Stellen Sie die Vorrichtung nicht in ein unbelüftetes Gestell oder unmittelbar über wärmeerzeugende Geräte wie z.B. Tonverstärker. Halten Sie die in den Produktspezifikationen angegebene maximale Umgebungstemperatur bei Betrieb ein.  
Schlitze und Öffnungen im Gehäuse dienen der Belüftung; um verlässlichen Betrieb sicherzustellen und Überheizen zu vermeiden dürfen diese Öffnungen nicht verstopft oder abgedeckt werden. Stecken Sie nie irgend einen Gegenstand durch die Belüftungsschlitze. Vergießen Sie keine Flüssigkeiten auf den Apparat.  
Dieses Produkt ist mit einem 3-drahtigen Erdungsstecker ausgerüstet. Diese Sicherheitsmaßnahme darf nicht unwirksam gemacht werden.  
Schließen Sie nie Tonverstärker unmittelbar an einen Anschluß des Apparates an.  
Um elektrischen Schlag oder Feuer zu vermeiden, setzen Sie den Apparat weder Regen noch Feuchtigkeit aus und betreiben Sie ihn nicht dort wo Wasser eindringen könnte.  
Versuchen Sie nicht den Apparat zu betreiben falls er fallen gelassen, beschädigt, oder Flüssigkeiten ausgesetzt wurde, oder falls sich seine Arbeitsweise derart ändert daß daraus ein Bedarf nach Reparatur zu schließen ist.  
Dieser Apparat sollte nur von qualifizierten Fachleuten geöffnet werden. Das Abnehmen von Abdeckungen setzt Sie gefährlichen Spannungen aus.



Dieses Dreieck auf Ihrem Apparat warnt Sie vor nicht-isolierter, gefährlicher Spannung im Gehäuse ... stark genug um eine Berührungsgefahr darzustellen.



Dieses Dreieck auf Ihrem Apparat bedeutet daß wichtige Betriebs- und Wartungsanweisungen in der mitgelieferten Dokumentation zu finden sind.

Español  
**Instrucciones importantes de seguridad**

Guarde estas instrucciones para uso posterior.  
Utilice siempre el voltaje correcto. Diríjase a las instrucciones de operación del fabricante para obtener las especificaciones de potencia. Esté al tanto de que voltajes de operación distintos requieren el uso de cables y/o enchufes distintos.  
No instale esta unidad en un estante sin ventilación, ni tampoco directamente encima de equipos que generen calor tales como amplificadores de potencia. Fíjese en las temperaturas ambientales máximas de operación que se mencionan en las especificaciones del producto.  
Las aperturas y ranuras del chasis sirven para proveer la ventilación necesaria para operar la unidad con seguridad y para prevenir sobrecalentamiento, y por lo tanto no pueden ser obstruidas o cubiertas. No introduzca objetos de ningún tipo a través de las ranuras de ventilación, y nunca deje caer ningún líquido sobre la unidad.  
Este producto está equipado con un enchufe de 3 clavijas con conexión a tierra. Éste es un elemento de seguridad que no debe ser eliminado.  
Nunca conecte ningún tipo de salida de amplificadores de sonido directamente a los conectores de la unidad.  
Para prevenir descargas eléctricas o incendios, mantenga la unidad alejada de la lluvia, humedad o cualquier lugar en el que pueda entrar en contacto con agua.  
No trate de hacer funcionar la unidad si se ha caído, está dañada, ha entrado en contacto con líquidos, o si nota cualquier cambio brusco en su funcionamiento que indique la necesidad de hacerle un servicio de mantenimiento.  
Esta unidad deberá ser abierta únicamente por personal calificado. Si usted quita las coberturas se expondrá a voltajes peligrosos.



Este triángulo que aparece en su componente le advierte sobre la existencia dentro del chasis de voltajes peligrosos sin aislantes ... voltajes que son lo suficientemente grandes como para causar electrocución.



Este triángulo que aparece en su componente lo alerta sobre las instrucciones de operación y mantenimiento importantes que están en los materiales de lectura que se incluyen.

Français  
**Instructions de Sûreté Importantes**

Gardez ces instructions pour référence future.  
Observez toutes les instructions et tous les avertissements marqués sur l'appareil.  
Branchez uniquement sur un réseau de tension indiquée. Consultez le manuel d'instruction du fabricant pour les spécifications de courant. N'oubliez pas que différentes tensions peuvent nécessiter l'utilisation de câbles et/ou de fiches de connexion différents.  
N'installez pas l'appareil en un compartiment non-aéré ou directement au-dessus d'équipements générateurs de chaleur, tels qu'amplificateurs de courants, etc. Ne dépassez pas la température ambiante maximale de fonctionnement indiquée dans les spécifications du produit.  
Des fentes et ouvertures sont prévues dans le boîtier pour l'aération; Pour assurer le bon fonctionnement et pour prévenir l'échauffement, ces ouvertures ne doivent pas être couvertes ou bloquées. N'insérez pas d'objets dans les fentes d'aération. Empêchez tout liquide de se répandre sur l'appareil.  
Ce produit est muni d'une fiche à trois fils pour la mise à terre. Ceci est une mesure de sécurité et ne doit pas être contrariée.  
Ne connectez jamais d'amplificateurs audio directement aux connecteurs de l'appareil.  
Pour empêcher les chocs électriques et le danger d'incendie, évitez d'exposer l'appareil à la pluie ou à l'humidité, et ne le mettez pas en marche en un endroit où il serait exposé aux éclaboussures d'eau.  
N'essayez pas de faire fonctionner l'appareil s'il est tombé à terre, a été endommagé, exposé à un liquide, ou si vous observez des différences nettes dans son fonctionnement, indiquant la nécessité de réparations.  
Cet appareil ne doit être ouvert que par un personnel de service qualifié. En enlevant les couvercles vous vous exposez à des tensions électriques dangereuses.



Ce triangle, sur votre appareil vous avertit de la présence de tension dangereuse, non-isolée à l'intérieur du boîtier... une tension suffisante pour représenter un danger d'électrocution.



Ce triangle sur votre appareil vous invite de suivre d'importantes instructions d'utilisation et d'entretien dans la documentation livrée avec le produit.

Italiano  
**Importanti norme di sicurezza**

Conservare le presenti norme per l'utilizzo futuro.  
Osservare tutte le istruzioni e le avvertenze apposte sull'unità.  
Utilizzare esclusivamente con la tensione di rete corretta. Consultare le istruzioni operative fornite dal fabbricante per i dati riguardanti la tensione e l'assorbimento di corrente. Potrebbe essere necessario l'uso di cavi di rete e/o di spine diverse a seconda della tensione utilizzata.  
Non installare l'unità in uno scaffale privo di ventilazione oppure direttamente sopra una fonte di calore, come, ad esempio, un amplificatore. Non superare la temperatura ambientale massima di funzionamento riportata nei dati tecnici del prodotto.  
Le fessure e le altre aperture nella scatola servono alla ventilazione. Per un funzionamento affidabile, e per evitare un eventuale surriscaldamento, queste aperture non vanno ostruite o coperte in nessun modo. Evitare in tutti i casi di inserire oggetti di qualsiasi genere attraverso le fessure di ventilazione. Non versare mai del liquido di nessun tipo sull'unità.  
Questo prodotto viene fornito con una spina a 3 fili con massa. Tale dispositivo di sicurezza non va eliminato.  
Evitare sempre di collegare le uscite dell'amplificatore audio direttamente ai connettori dell'unità.  
Per prevenire il pericolo di folgorazione e di incendio non esporre l'unità alla pioggia o ad un'umidità eccessiva; evitare di adoperare l'unità dove potrebbe entrare in contatto con acqua.  
Evitare di adoperare l'unità se la stessa è stata urtata violentemente, se ha subito un danno, se è stata esposta ad un liquido o in caso di un evidente cambiamento delle prestazioni che indichi la necessità di un intervento di assistenza tecnica.  
Ogni intervento sull'unità va eseguito esclusivamente da personale qualificato. La rimozione della copertura comporta l'esposizione al pericolo di folgorazione.  
Il presente triangolo impresso sul componente avverte della presenza di tensioni pericolose non isolate all'interno della copertura... tali tensioni rappresentano un pericolo di folgorazione.  
Il presente triangolo impresso sul componente avverte l'utente della presenza nella documentazione allegata di importanti istruzioni relative al funzionamento ed alla manutenzione.



Il presente triangolo impresso sul componente avverte della presenza di tensioni pericolose non isolate all'interno della copertura... tali tensioni rappresentano un pericolo di folgorazione.



Il presente triangolo impresso sul componente avverte l'utente della presenza nella documentazione allegata di importanti istruzioni relative al funzionamento ed alla manutenzione.



## Introduction

<b>1. Controls and Connectors .....</b>	<b>1-1</b>
Unpacking • Power • Mounting .....	1-1
Front Panel Controls .....	1-2
Front Panel Detail .....	1-3
Rear Panel Connectors .....	1-5
Audio Connections .....	1-6
Connectors • Cables	
<b>2. Digital Audio Data .....</b>	<b>2-1</b>
Sample Rates and Synchronization .....	2-1
Digital Data and Formatting .....	2-3
The AES Data Format .....	2-4
Channel status: Professional format • Consumer format	
The SDIF-2 Data Format .....	2-8
<b>3. Using the LFI-10 .....</b>	<b>3-1</b>
Selecting a Conversion Mode .....	3-1
Selecting a Unidirectional Conversion Mode • Selecting a Bidirectional Conversion Mode	
Navigating the Menu .....	3-8
LFI-10 Menu Controls	
Viewing the Incoming Data .....	3-10
AES Channel Status • AES User Data • SDIF-2 Data	
Specifying the Output Data .....	3-12
Selecting the Output Format • Altering the Output Data	
Altering AES and S/PDIF Channel Status Data • AES (pro format) Channel Status Menu Selections • S/PDIF (consumer format) Channel Status Menu Selections • Altering AES User Data • Altering SDIF-2 Data	
Miscellaneous Menu Functions .....	3-27
SDIF-2 Phase Adjustment • Auto Mute • AES CH A/B	
CRC Error Count • Parity Error Count • Validity Error Count	
Error Mode • Diagnostics • Initialization of User Registers	
Store and Recall .....	3-30
AES Channel Status Reference (Professional Format) .....	3-31
S/PDIF Channel Status Reference (Consumer Format) .....	3-32
<b>4. Troubleshooting .....</b>	<b>4-1</b>
Low Voltage .....	4-1
Overheating .....	4-1
Solving Problems .....	4-1
Diagnostics .....	4-3
<b>5. Specifications .....</b>	<b>5-1</b>





## Introduction

The LFI-10 is a digital audio format interface which enables viewing and editing of auxiliary data embedded in a digital audio data stream. When placed in line between two pieces of digital audio equipment, this simple interface allows you to convert from one audio format to another, or to view and modify the auxiliary data embedded in the digital audio bitstreams. The LFI-10 provides front-panel indication of all data error types (CRCC, Validity, Parity) with internal error counters for each, and gives you access to all 24 bytes of the Channel Status and User blocks in the AES/EBU and S/PDIF data streams. The unit provides access to the emphasis and dub-prohibit bits in the SDIF-2 data stream and allows adjustment of the input and output word clocks relative to the input and output serial data on the SDIF-2 interface.

When the current interface standards (AES/EBU\*, S/PDIF\*\* or SDIF-2) are poorly specified or only partially implemented, the LFI-10 provides a simple tool to view and edit the digital data, allowing you to find and eliminate communications problems.

This manual provides some basic information on digital audio (Chapter 2) but assumes the user will be familiar with the digital audio interface formats handled by the LFI-10. We have attempted to include information about these formats which is relevant to the use of the unit, but including the interface specifications in their entirety is beyond the scope and the authority of this manual. Where more detailed information is required, particularly with regard to the AES formats, we refer you to:

Standards Secretariat  
Audio Engineering Society, Inc.  
60 East 42nd Street, Room 2520  
New York, NY 10165 USA

Information on specific data which may be required by any target device should be obtained from the manufacturer.

*Lexicon has attempted to provide correct information and functional capability corresponding to digital audio standards known and available to us at the time of publication of this document and manufacture of this instrument. As standards evolve, Lexicon may make updates to documentation and/or system software available for purchase.*

*Lexicon's warranty on this product excludes consequential damages resulting from the use of this product in the recording or transfer of digital audio. Local jurisdiction may extend the user additional rights.*

### \* AES/EBU Interface (Professional)

The AES/EBU interface conforms to both the AES ANSI S4.40-1985 specification and the EBU document, Tech 3250-E. Both inputs and outputs are balanced, transformer-coupled designs, with a female XLR input and a male XLR output, conforming to the standard convention of IEC 268, Part 12. Input and output levels comply with CCITT V.11. As of November 20, 1991, new versions of the professional digital audio format specifications were under review by AES, EBU and IEC. Until new specifications are published, this device must conform to currently approved specifications. On this device, the professional form of the digital audio and auxiliary data has been labeled "AES/EBU" in accordance with general usage.

### \*\* S/PDIF – Sony/Phillips Digital Interface Format (Consumer)

The S/PDIF interface conforms to the Channel Status Type II format, as specified in the EIAJ CP-340 Digital Audio Interface Standard, dated September, 1987, and to IEC 958, First Edition 1989-03. As of November 20, 1991, amendments to IEC 958, which include specifications for the implementation of auxiliary data for the consumer format, were under review. Until new specifications are published, this device must conform to currently approved specifications. On this device, the consumer form of the digital audio and auxiliary data has been labeled "S/PDIF" in accordance with general usage.





After unpacking the LFI-10, save all packing materials in case you ever need to ship the unit. Thoroughly inspect the LFI-10 and packing materials for signs of damage. Report any shipment damage to the carrier at once. The following accessories are included with the LFI-10:

1. Power Cable
2. User Guide
3. Quick Reference Guide

**Unpacking**

The LFI-10 is equipped with a 3-pin IEC connector and detachable line cord. Connect the cable end of the LFI-10 line cord to the LFI-10 power connector. Then plug the line cord into an AC wall socket providing voltage corresponding to the data plate on the unit.

**Power**

The LFI-10 measures 19"W x 1.75"H x 13.9"D (483 x 45 x 353 mm). Make sure that the LFI-10 is securely screwed into the rack, and that support is provided for the rear of the chassis during transport to avoid possible damage from severe mechanical shock.

**Mounting**

The maximum ambient operating temperature is 95°F (35°C). Provide adequate ventilation if the LFI-10 is mounted in a closed rack with heat-producing equipment.

# LFI-10 Front Panel Controls

## SDIF-2

Press on, press off selection for bidirectional conversion modes. Lights when ON, and limits second input choice to the three AES-type inputs.

Status LEDs are updated whenever there is a change in the status of AES data. (See Input detail next page.)

## Display

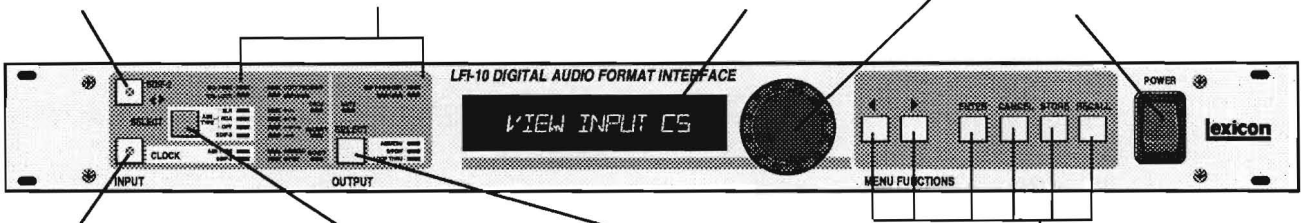
16-character FIP for viewing menu choices and data.

## Scroll knob

Allows scrolling through the available menu choices.

## POWER

Power on/off.



## CLOCK

Allows selection of which input is to be the word clock master for the LFI-10.

## Input SELECT

In unidirectional conversion modes, selects which of four inputs is active. (If a bidirectional mode has been selected by pressing SDIF-2, selects from among the three AES-type inputs.)

## Output SELECT

Toggles the three available output modes: LOOP-THRU, AES/EBU and S/PDIF. (See Output detail next page.)

Status LEDs indicate which output mode is currently selected.

## Menu Functions

**Arrowed Keys:** Allow stepping forward and backward through menu choices and selection of character location in alphanumeric entries.

**Enter:** Activates menu selections.

**Cancel:** Exits the current menu without performing the action selected and exits to the next higher menu level. (Pressing repeatedly will step back to the top level menu.)

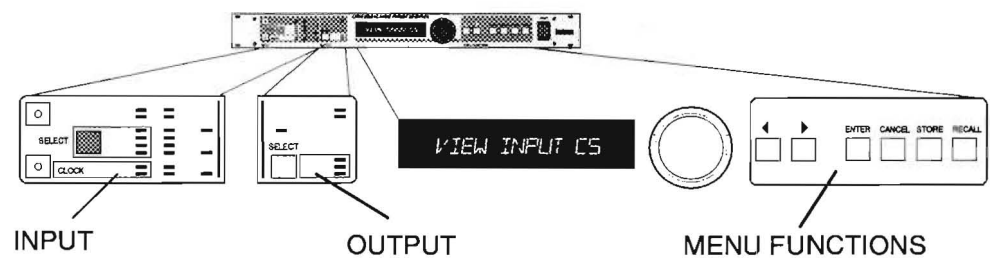
**Store:** Stores the current setup in a User register.

**Recall:** Retrieves a preset or setup and makes it the current setup for the unit.



## LFI-10 Front Panel Detail

The LFI-10 front panel controls are divided into three functional groups: INPUT, OUTPUT and MENU FUNCTIONS.



### INPUT

Operational modes are selected from the front panel INPUT section. (See previous page.) Status LEDs in this section provide visual confirmation of mode selection as well as information regarding the current status of incoming AES data.

#### SIG PRES

Lit when a valid AES input signal is detected on the selected input connector.

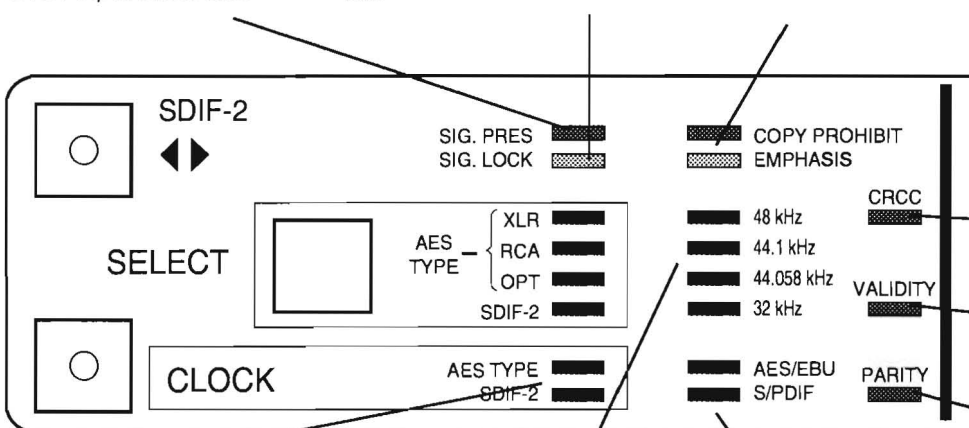
#### SIG LOCK

Indicates whether or not the phase lock loop has locked onto the incoming AES signal.

#### COPY PROHIBIT EMPHASIS

Indicate whether incoming AES data has copy protection and emphasis bits set. The EMPHASIS LED will be

off if incoming data has emphasis specified as NONE or NI (emphasis not indicated.)



#### CLOCK LEDs

Indicate the input selected as the word clock master for the LFI-10. The LED in the CLOCK button lights to indicate a mismatch between input types and the selected clock master.

#### FREQUENCY LEDs

Indicate the *measured* frequency of the incoming digital frame rate. This LED will flash if there is a mismatch between the detected frequency and the frequency specified in the Channel Status block.

#### AES/EBU SPDIF

Indicate the type of Channel Status information being received — "professional" (AES/EBU) or "consumer" (S/PDIF).

#### ERROR LEDs

Light to indicate various error states in the incoming AES-type data stream:

**CRCC** indicates a CRC error in incoming AES Channel Status data.

**VALIDITY** indicates that the Validity bit is set in a frame of incoming AES data.

**PARITY** indicates a Parity error in incoming AES data.

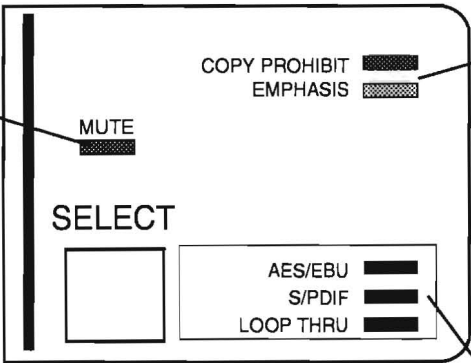
The behavior of these LEDs can be altered with menu controls.

OUTPUT

The format of transmitted audio data is selected from the front panel OUTPUT section. (See previous page.) LEDs in this section provide visual confirmation of output selection as well as the status of automatic muting and the settings of Copy Prohibit and Emphasis bits in the outgoing AES data stream.

MUTE

Indicates that output data is being automatically muted. Muting occurs when no signal is present on a selected AES-type input. Automatic muting can be disabled from the menu controls.



COPY PROHIBIT  
EMPHASIS

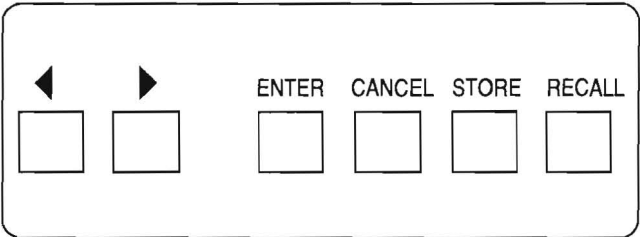
Indicate the current setting of the Copy Prohibit and Emphasis bits in the outgoing AES data stream. These LEDs light when the corresponding bits are set. The EMPHASIS LED will be off if the Channel Status block selected for transmission has emphasis specified as NONE or NI (emphasis not indicated.)

AES/EBU  
S/PDIF  
LOOP THRU

One of these LEDs will light to confirm your output selection. In AES/EBU and S/PDIF output modes, the content of individual fields of the output block are controlled through the menus. LOOP THRU indicates that Channel Status information is being passed through unchanged.

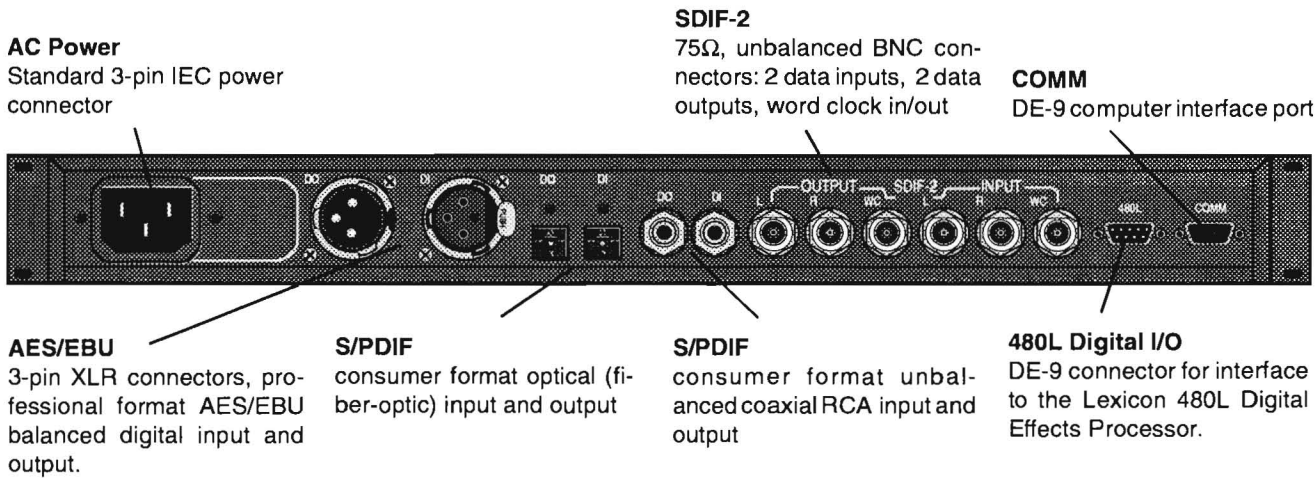
MENU FUNCTIONS

This control section allows selection of displayed menu items, and contains STORE and RECALL keys for storing and retrieving commonly used setups. The arrowed keys are used to step forward and backward through menu items, and for selection of character location in alphanumeric entries. For more detail on the menu choices, see Chapter 3 *Using the LFI-10*.





LFI-10  
Rear Panel  
Connectors



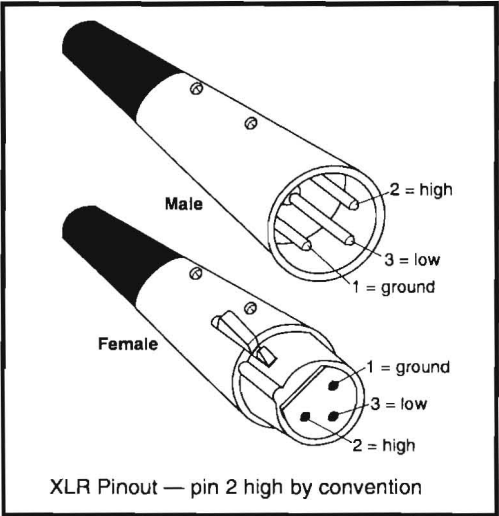
The input and output connectors conform to published standards for professional and consumer formats. The LFI-10, however, allows mismatching of connectors and format types, e.g. a professional format signal can be received on an RCA input, and consumer formatted data output on the XLR connector.

Audio Connections

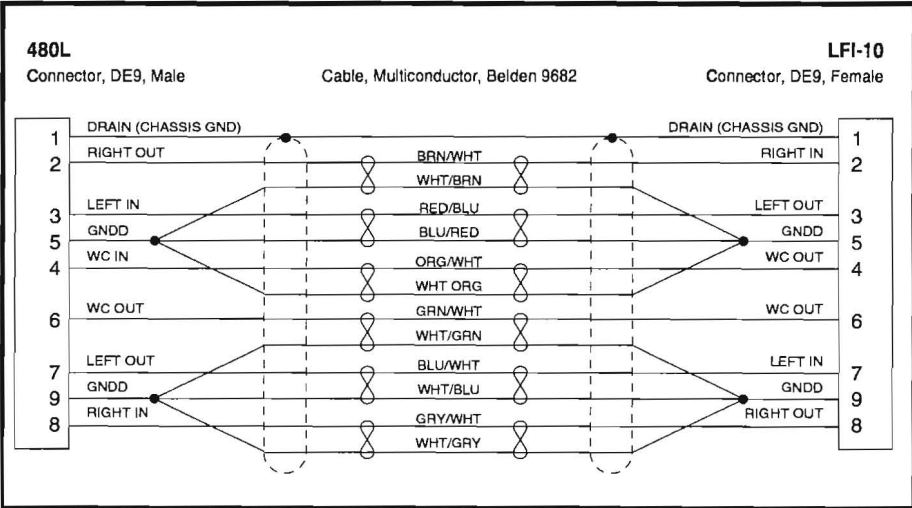
Connectors

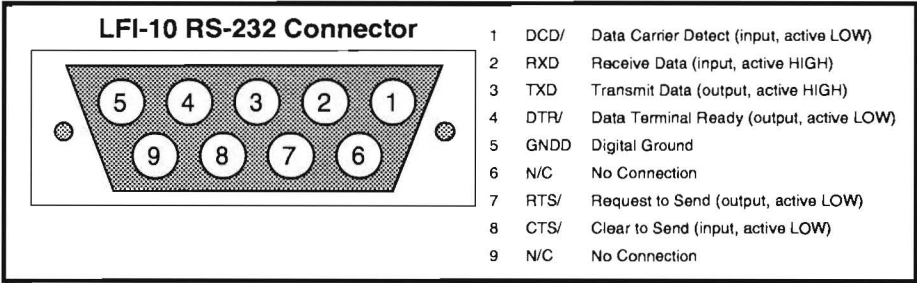
Signal	Mating Connector	Description
AES/EBU Digital Input	XLR A3M	Balanced RS-422 pin 2 high
AES/EBU Digital Output	XLR A3F	Balanced RS-422 pin 2 high
S/PDIF Consumer Digital Input and Output	RCA	Unbalanced 75Ω
S/PDIF Consumer Digital Audio Optical Input and Output		Consumer Digital
SDIF-2	BNC	Unbalanced 75Ω
480L Interface	DE-9	
RS-232	DE-9	

XLR Pinout



480L/LFI-10  
SDIF-2 Interface  
Connections





COMM Pinout

Cables

This interface requires balanced connections using high-quality, low-capacitance, controlled-impedance, data communication, twisted-shielded pair cable. **It will not work reliably if microphone cable is used.**

AES/EBU  
Digital Audio I/O

Use commercially-available, consumer audio optical cable assemblies.

S/PDIF  
Consumer Digital Audio I/O

This interface is unbalanced but, because it carries digital signals, it requires the use of 75Ω RG-59 coaxial cable.

SDIF-2

SDIF-2 is not self-clocking and has provisions for word clock inputs and outputs. The recommended cable has six twisted pairs with an overall Beldfoil shield, drain wire and copper braid. It is a low-capacitance cable designed for EIA RS-422 applications.

480L Digital Effects  
Processor

Below are recommended cable and cable assemblies. Similar cables from sources other than those listed here may be appropriate.

**AES/EBU**  
Belden 9271 (foil shield)

**S/PDIF Consumer Digital Audio**  
Belden 9259 (22 AWG conductor, .242 O.D.)  
Belden 8218 (27 AWG conductor, .150 O.D.)  
Maximum recommended length: 32 ft. (10M)

**S/PDIF Consumer Digital Audio Optical**  
Toshiba TOCP174y  
Sony POC-15  
Maximum recommended length: 16 ft. (5M)

**SDIF-2**  
75Ω RG-59 coaxial cable

**480L**  
Belden 9682

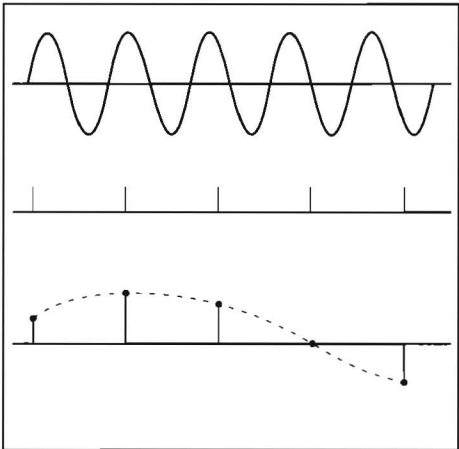
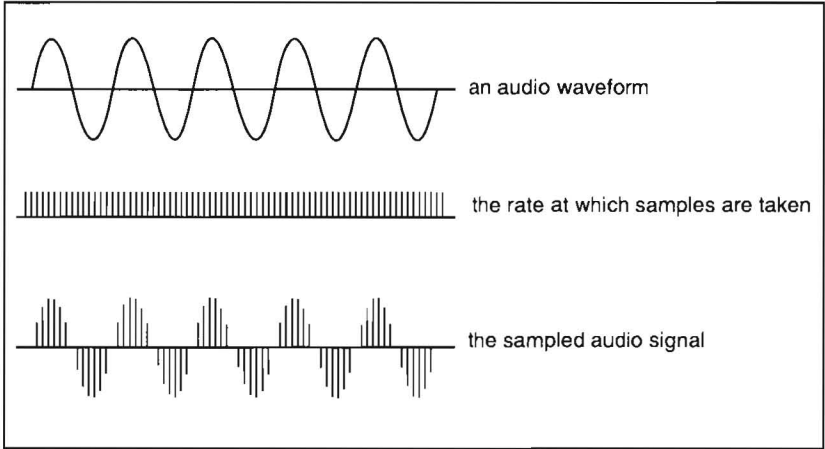




Digital signals are created by sampling an analog audio waveform at periodic intervals. A value is assigned to each sample according to the amplitude of the waveform at the point at which the sample was taken. This value is represented as a series of bits which make up a binary number called a *sample word*.

Sample Rates and  
Synchronization

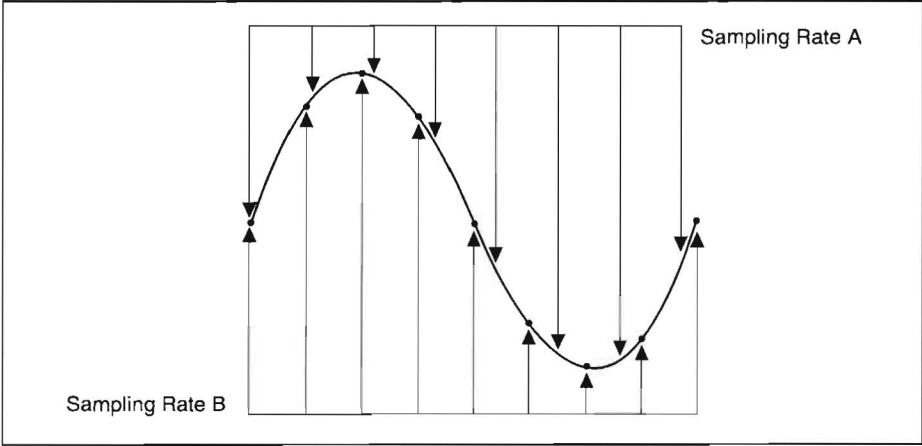
The *rate* at which samples are taken is critical — too low a sample rate will cause important data to be missed between samples, leading to aliasing; too high a rate will yield more information than can be processed efficiently.



Too low a sampling rate will cause important data to be lost.

To avoid aliasing, the sample rate must exceed twice the highest frequency of the signal being sampled. Given the frequency range of human hearing, the commonly accepted digital audio sample rates are within the range of 30-50kHz.

Once a signal has been sampled, it is no longer a waveform, but a series of discrete samples taken at specific intervals. This series of samples can only be accurately read by another device using the same sampling interval.



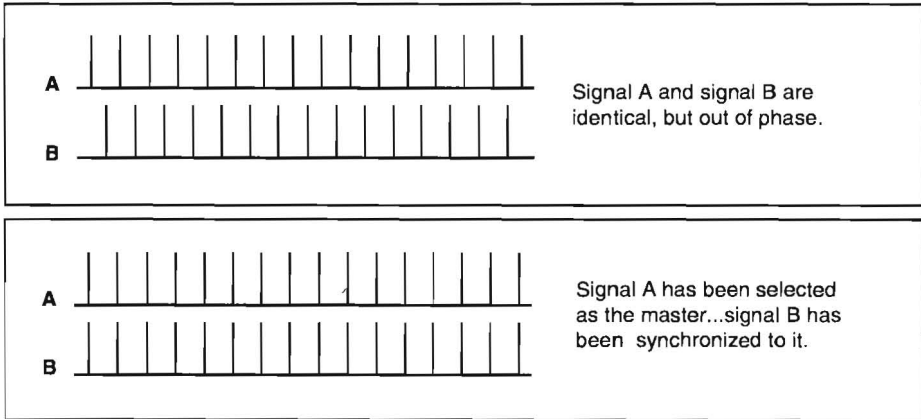
Different sampling rates produce different data streams from the same signal.

To enable communication between devices, the audio industry has accepted several sample rates as standards. Professional audio equipment commonly uses a sampling rate of **48kHz**, established before the popularity of the Compact Disc. The consumer Compact Disc and its associated production equipment established another standard of **44.1kHz**. The PCM adapters used on NTSC video recorders are set at **44.056kHz**, but can usually interchange audio with 44.1kHz devices. A **32kHz** rate, proposed for digital broadcasting, is not yet in common use.

Two digital audio products will not communicate with each other unless they are each using the same sample rate. Simply choosing the same sample rate, however, is not enough to assure communication. This is because it is not possible to build a device which will run *exactly* at a given sample rate – there is always some tolerance, or error. The resulting difference between the sample rates of two devices causes one to have fewer audio samples than the other over a given period of time.

For example, suppose two devices are set up to the standard sampling rate of 48kHz but, in fact, differ in frequency by 0.001 percent (a fairly typical frequency error). Every two seconds, one device will have one more or one less sample than the other device. This could cause an audible click every two seconds as the receiving device added or dropped a sample.

The solution to this problem is to truly synchronize all of the devices in a system to one single sample rate. This is done by choosing one device in the system and making it the *master*. All other digital devices in the system must then *slave* to the sample rate originating from the master. To interconnect various pieces of digital audio equipment, you must know which device is intended to be the master, and be able to set every other device in the system to be a slave. Since the LFI-10 is an interface device, it is never the master, and offers several options for establishing synchronization.



*Signals must be synchronized by selecting one signal to be the master. All other signals are slaved to the timing reference of this master.*

Once a sample rate has been established for a system, the string of binary numbers representing the audio signal must have information added to it to make it useful. The source of the signal, identification of the beginning and end of the audio sample words, channel assignment, and the sample rate, are examples of the kinds of information that must be included if the audio signal is to be communicated from one device to another. This is accomplished by adding additional bits in a fixed order to the data stream.



## Digital Data and Formatting

When digital data is sent serially over a single cable, some sort of order must be imposed to enable differentiation of individual bits in the data bit stream. Without ordering, the data is meaningless to the receiver, and even simple tasks such as identifying the beginning and end of a data stream, or the source of the transmitted data would be impossible.

Formatting gives such ordering to the data, allowing labels to be applied to different portions of the data bit stream.

Generally, a format is designed to group data bits into identifiable substructures, or *blocks*. The size of a block is usually determined by some natural grouping such as the number of bits which can be transmitted within a specified time. Blocks can then be further subdivided into a manageable substructure by defining certain bits as *control bits*. Control bits identify specific types of data such as block starts. Further subdivision can organize data into meaningful groups. In digital audio, for example, channel routing data is distinguished from the audio samples. This subdividing continues until information is assigned to every single bit in the block.

**It is the control bits which actually define the format and make sensible communication of data possible.**

Digital audio standards are published formats used by manufacturers to design equipment that communicates readily over standard interfaces. Because several standards have evolved, and because some manufacturers fail to completely implement them, communication between devices is not flawless. Devices with different formats don't communicate, and partially incompatible devices communicate unreliably. The LFI-10 provides an interface for devices using the most common standards, displaying and allowing alteration of the information which you need to establish reliable communication.

In order to best use the LFI-10, you must be familiar with those digital audio standards. While it is beyond the scope of this manual to detail the standards in their entirety, this section of the manual will provide an overview of the basic structure of the data formats currently in common use: the AES (Audio Engineering Society) professional format, the S/PDIF consumer format (Sony/Phillips Digital Interface Format), and the SDIF-2 format (Sony Digital Interface Format).

## The AES Data Format

The AES Digital Audio Interface is defined in the published standard AES3-1985 and is properly known as "Serial Transmission Format for Two-Channel Linearly Represented Digital Audio Data".

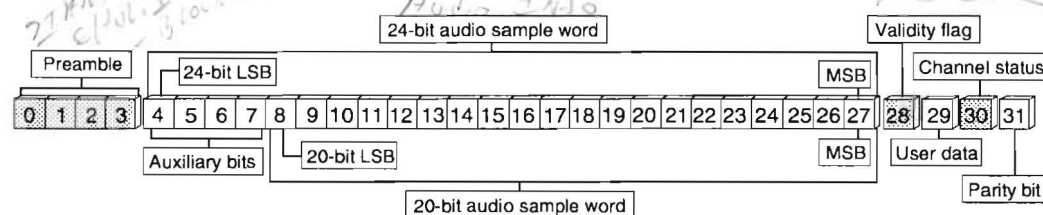
Data formatted according to the AES3 specification is transmitted as a series of 32-bit words, called *sub-frames*. The first four bits in any sub-frame are called *preambles*. Three unique types of preambles identify the start of a block, as well as the channel designation of the audio data to follow.

The data which follows the preamble (the *audio sample word*) can be 20 or 24 bits long. This audio sample word contains the actual audio data for the channel specified by the preamble.

Following the audio sample word are four bits designated as *Validity*, *User Data*, *Channel Status* and *Parity*. These four bits are sometimes referred to as carrying *auxiliary information*. Of these four bits, Validity and Parity are used to confirm data integrity. The User data bit is provided for manufacturers to use in any manner they wish — its use is not defined by the AES3 specification. The Channel status bit carries information associated with each audio channel such as emphasis, sampling frequency, etc. This information is carried in a fixed format which can be decoded by any user. We will be looking at this in detail later.

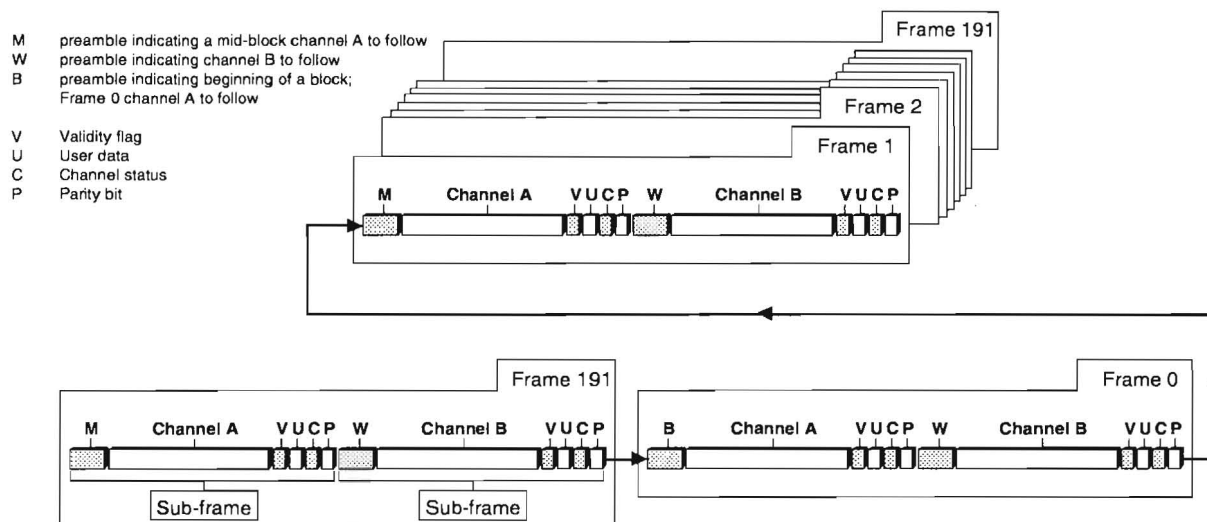
Two sub-frames, each carrying audio data for one stereo channel, make up a *frame*. A sequence of 192 frames make up a block. The basic structure of AES sub-frames, frames and blocks is shown on the following page.

The AES sub-frame consists of a single 32-bit word. . .

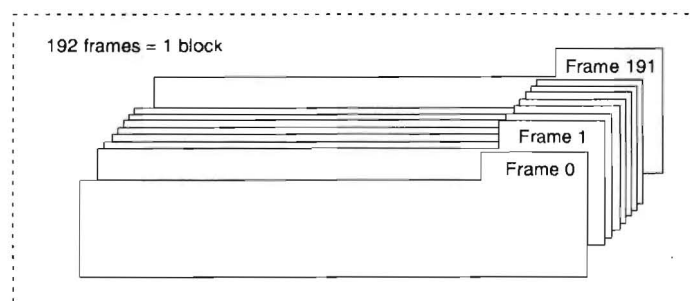


A frame consists of two sub-frames.

The sub-frame preamble identifies the start of a block and the channel designation of the audio data to follow. . .



192 frames make up a block. . .



AES sub-frame, frame and block structure



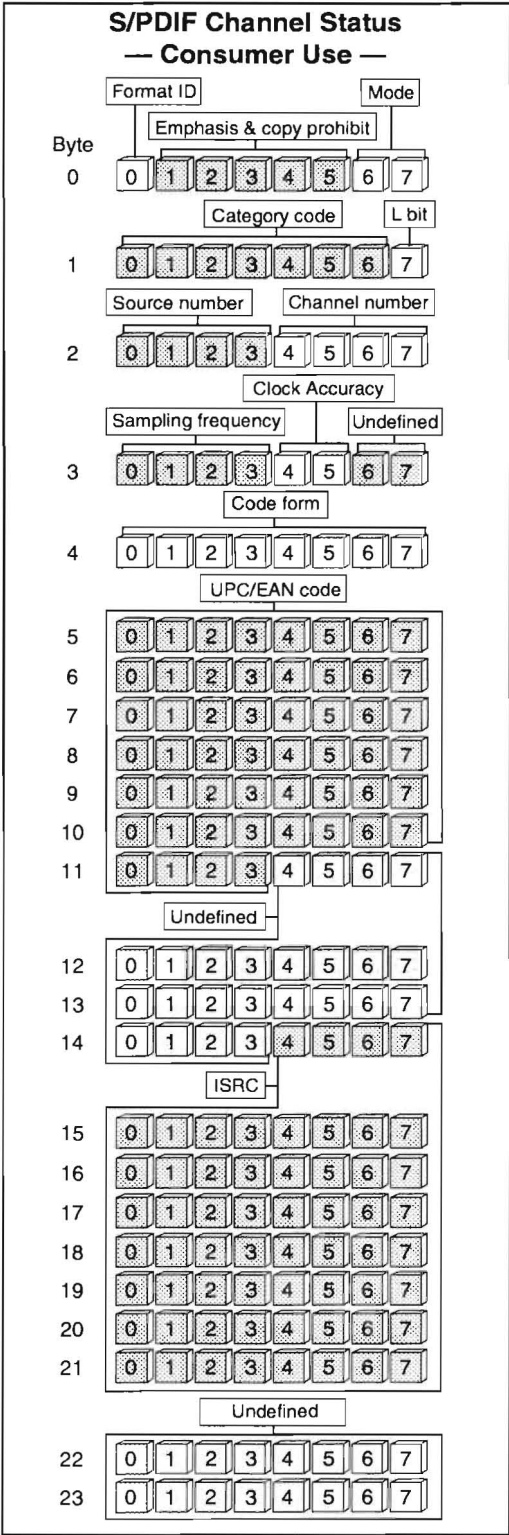
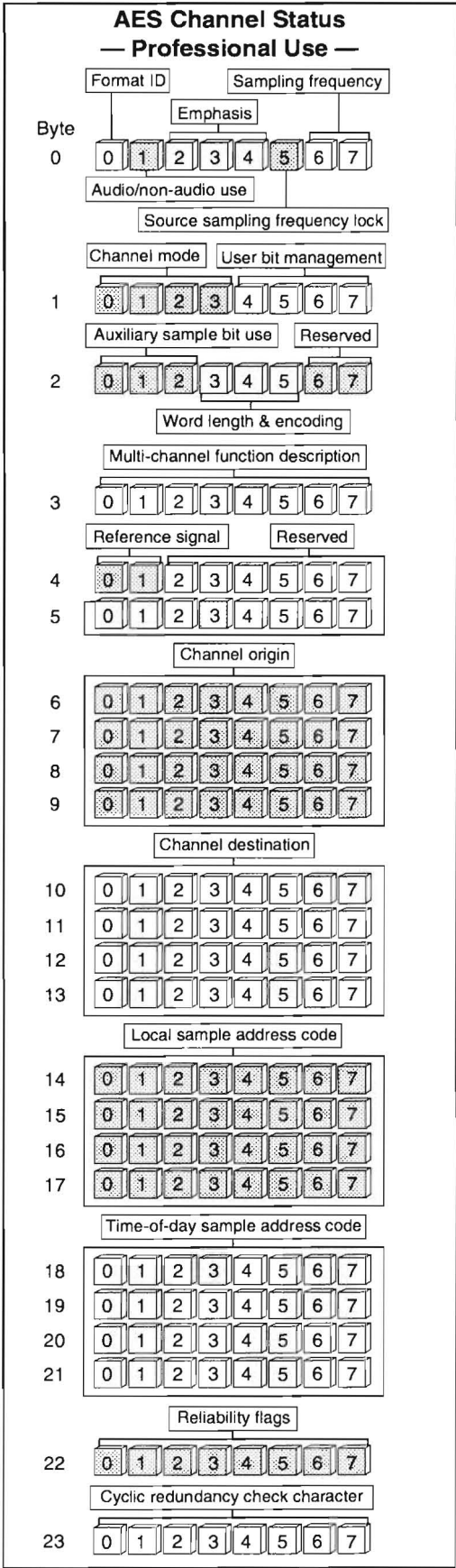
From each block of 192 frames, the User Data and Channel Status control bits are assembled individually into 24 8-bit bytes (192 bits).

If the Validity bit in a sub-frame is set, it indicates that the integrity of the audio sample in that sub-frame is in question. For example, if a digital audio tape player, such as a DAT machine, detects an error while reading a digital tape, it might perform a data masking operation on the sample in question and set the validity bit for that sample. The LFI-10 always passes the validity bit through unchanged from an AES input to an AES output.

The Parity bit is for detection of communication errors between two devices. The parity bit is set such that the total number of "1" bits in the sub-frame is an even number. If the receiving device detects an odd number of "1" bits in a sub-frame, it indicates an error occurred during transmission. The LFI-10 counts parity errors on reception and always generates "correct" parity on transmission.

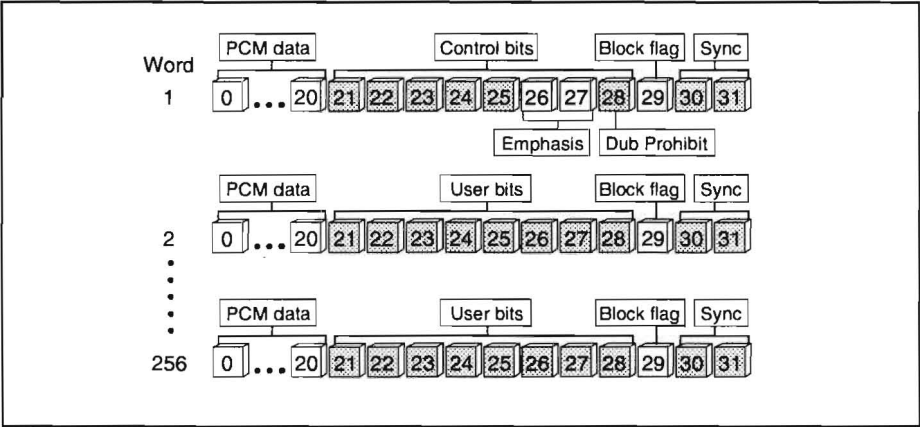
The LFI-10 both displays and allows you to alter User Data and Channel Status.

Two distinct formats have been defined for the Channel status block — one for "Professional Use" and one for "Consumer Use". Each of these formats is shown on the following page. All of these control bits can be accessed and altered with the LFI-10. Details of valid Channel Status data are presented in the following chapter: *Using the LFI-10*.



**The SDIF-2 Format** The SDIF-2 format is considerably simpler. Data formatted according to this specification is transmitted in blocks which consist of 256 32-bit words. Only the first of these words contains control bits.

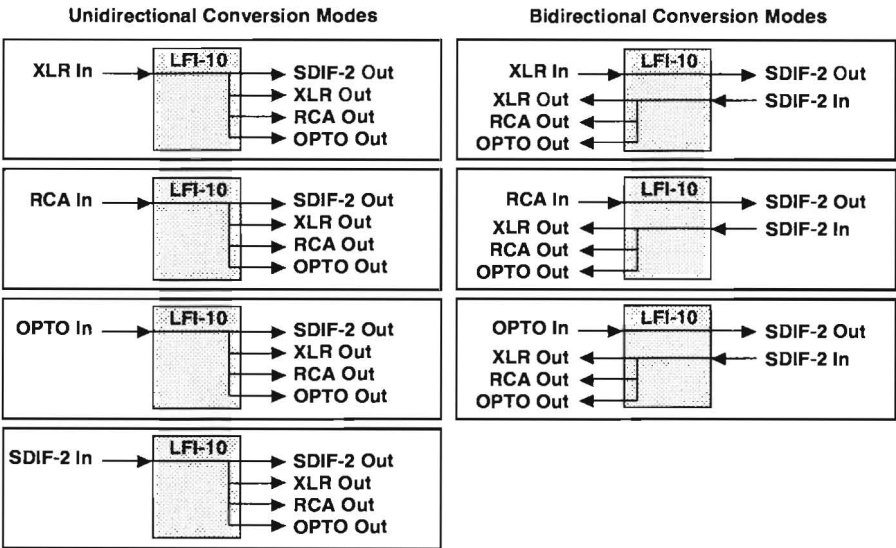
SDIF-2 data structure



The timing references selected by different manufacturers can be critical to communication between SDIF-2 devices. Adjustment of these timing references is available in the MISC FUNCTIONS menu. See Chapter 3 *Using the LFI-10* for a detailed description of SDIF-2 Phase Adjustment.

### Selecting a Conversion Mode

All of the conversion modes in the LFI-10 can be categorized as *unidirectional* or *bidirectional*.



Selection of any of these modes involves selecting the *connectors* you will be using for input, and selecting the *format* you want at the outputs. Front panel LEDs confirm the currently selected input and output modes, and provide status information on the incoming and outgoing audio data.

In these modes the LFI-10 will take digital audio data from one of its four inputs and transmit it to all four outputs. The input can be selected from the AES professional (XLR) or consumer (RCA or Optical) inputs or from the SDIF-2 input (BNC). To make an input connector active, press the front-panel INPUT SELECT button. LEDs in the input selection field will indicate which input connector is currently selected. Any signal detected at the selected input connector will automatically be sent both to the SDIF-2 output connectors and to all three of the AES-type output connectors. If no signal is present, the LFI-10 will automatically mute the outputs. (This auto mute function can be disabled from the MISC FUNCTIONS section of the menu if desired.)

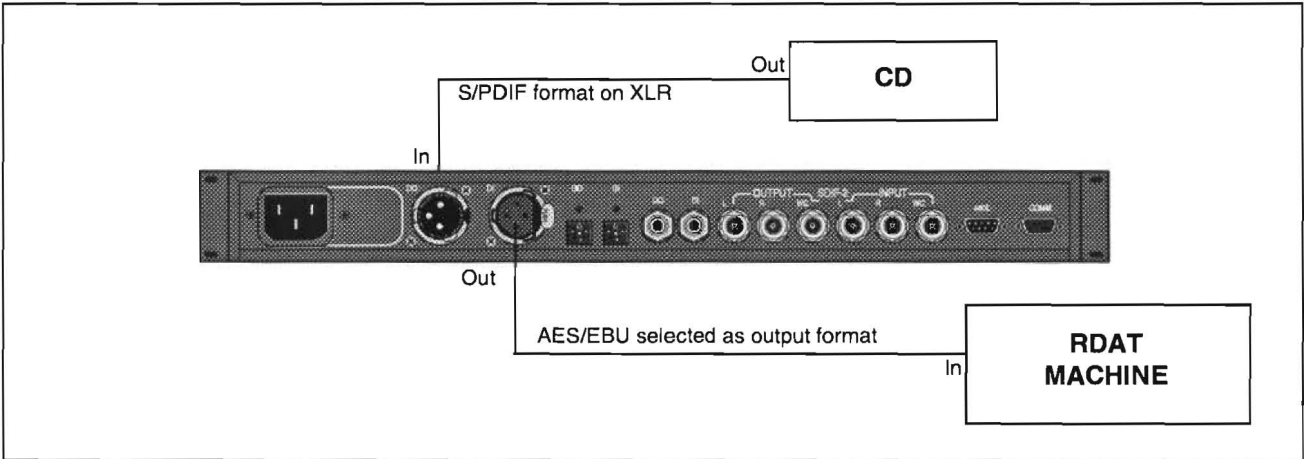
Once you have selected an input connector, use the front-panel OUTPUT SELECT button to choose the output mode you want (LOOP-THRU, which passes AES Channel Status information through unchanged, AES/EBU (professional), or S/PDIF (consumer) format.

### Selecting a Unidirectional Conversion Mode

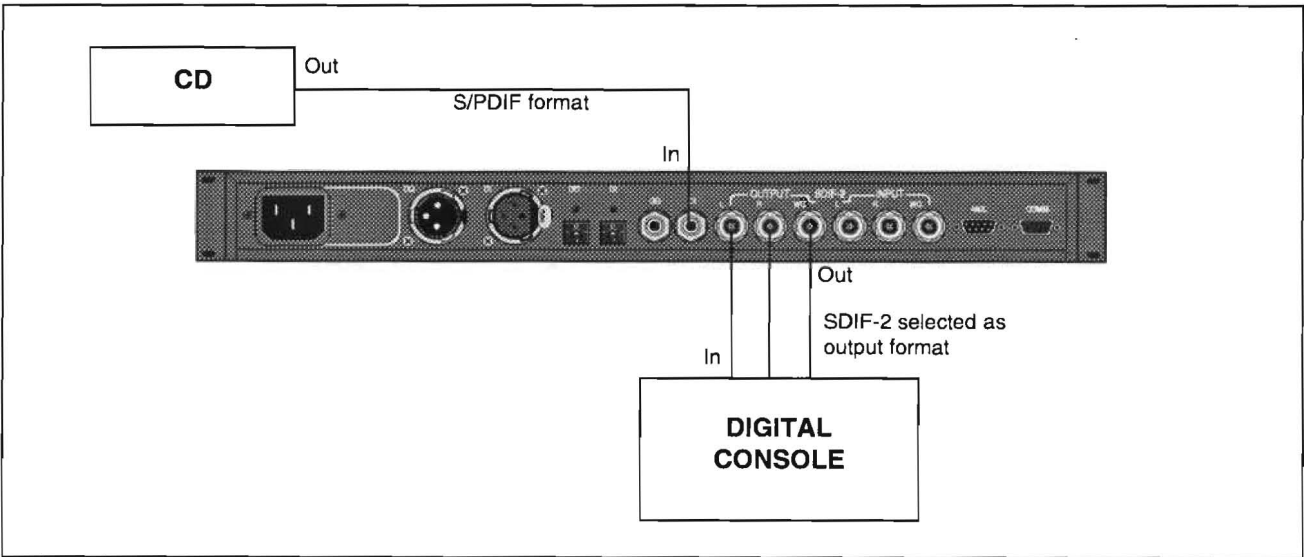


**Selecting a word clock source**

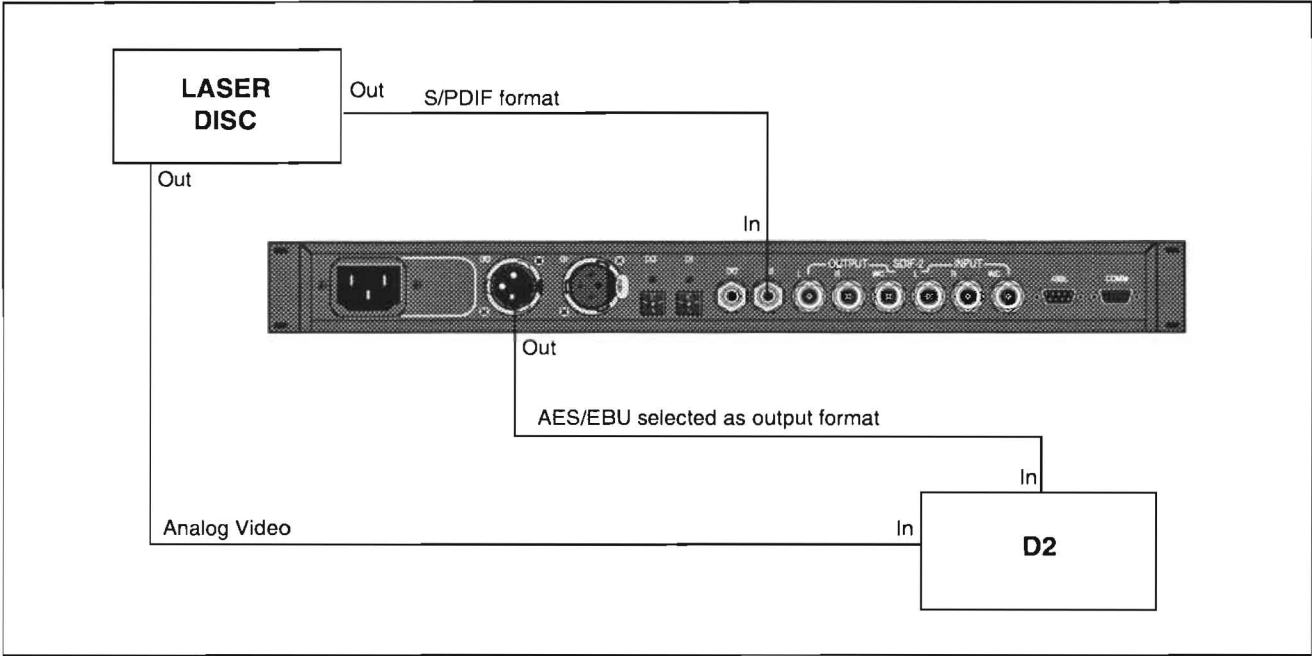
Even when you have only one input, you must select the appropriate signal *type* as the word clock source. The CLOCK button in the input section allows you to identify the input as the word clock master for the LFI-10 and connected devices. An LED adjacent to the CLOCK button will light to indicate whether you have selected an AES or SDIF-2 input as the word clock master. Pressing CLOCK will toggle between these two selections. An LED in the center of the CLOCK button will light as a warning if there is a mismatch between your input and clock selections. For example, if you are in a unidirectional mode and have chosen an AES-type connector, and CLOCK is set to SDIF-2, the warning LED will light. The same warning state will occur if you have selected SDIF-2 as the input in a unidirectional mode, but have selected AES-type as the clock master.



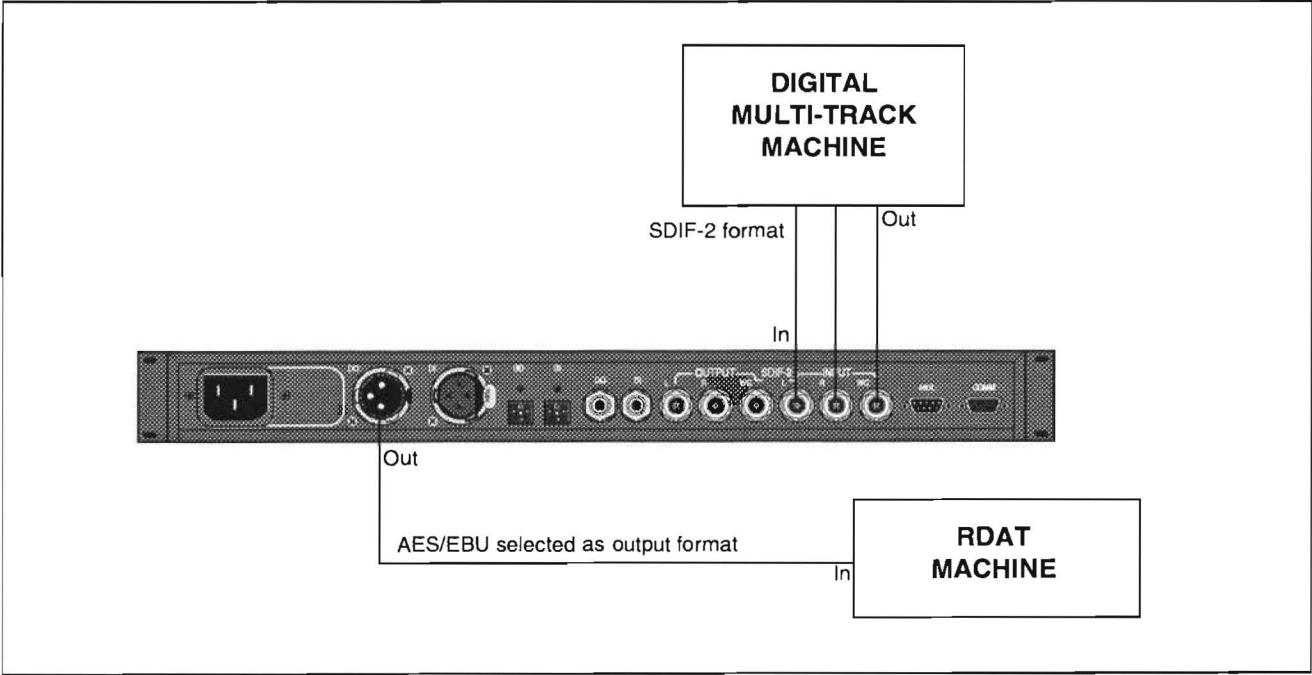
*Unidirectional Conversion:  
XLR In (carrying data in  
S/PDIF format); AES/EBU  
selected at LFI-10 front panel  
as output format*



*Unidirectional Conversion:  
RCA In; SDIF-2 Out*



Unidirectional Conversion:  
OPTO In; AES/EBU Out



Unidirectional Conversion:  
SDIF-2 In; AES/EBU Out

**Selecting a Bidirectional Conversion Mode**

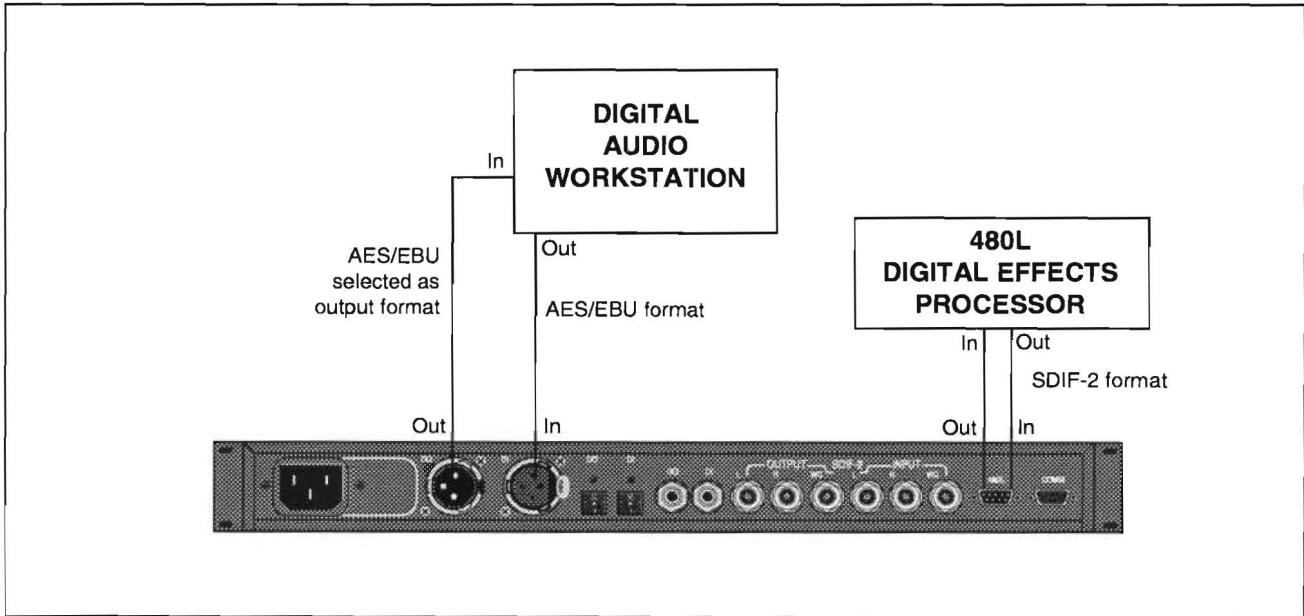
The bidirectional conversion modes simultaneously convert data from an SDIF-2 input to an AES-type output, and from an AES-type input to an SDIF-2 output. To select one of these modes, press the front-panel SDIF-2 button. This button will light to indicate that it is ON. (Press this button again to turn the bidirectional mode selection OFF.) When the SDIF-2 button is ON, the SDIF-2 LED in the input field will also light. Press INPUT SELECT to choose a second input from one of the three AES-types (XLR, RCA or OPTO).

**Selecting a word clock source**

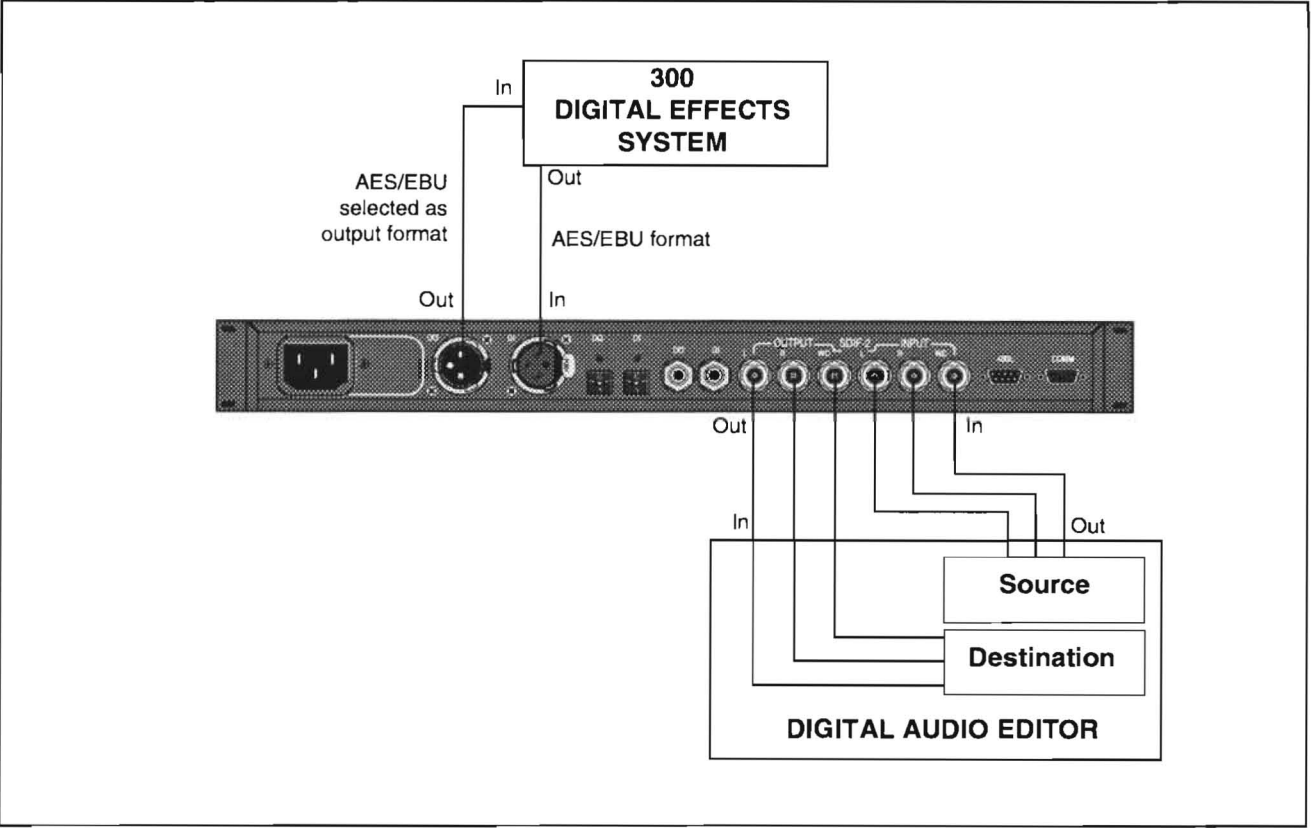
It is essential to specify which input is to be the word clock master for the LFI-10. The front-panel CLOCK button allows you to toggle between the two inputs you have chosen. An LED adjacent to the CLOCK button will light to indicate whether you have selected an AES or SDIF-2 input as the word clock master. Pressing CLOCK will toggle between these two selections. Note that the LED in the center of the CLOCK button will never light in bidirectional conversion modes, as your selection of AES-type or SDIF-2 inputs as master is optional. When you select the incoming AES signal to be the master, the front-panel SIG LOCK LED will light when the LFI-10 has locked onto the incoming signal.

The LFI-10 will automatically route the incoming AES signal to the SDIF-2 output, and the incoming SDIF-2 signal to all three AES-type outputs. Use the front-panel OUTPUT SELECT button to specify the output mode you want at the AES outputs — LOOP-THRU, which passes AES Channel Status information through unchanged, AES/EBU (professional), or S/PDIF (consumer) format.

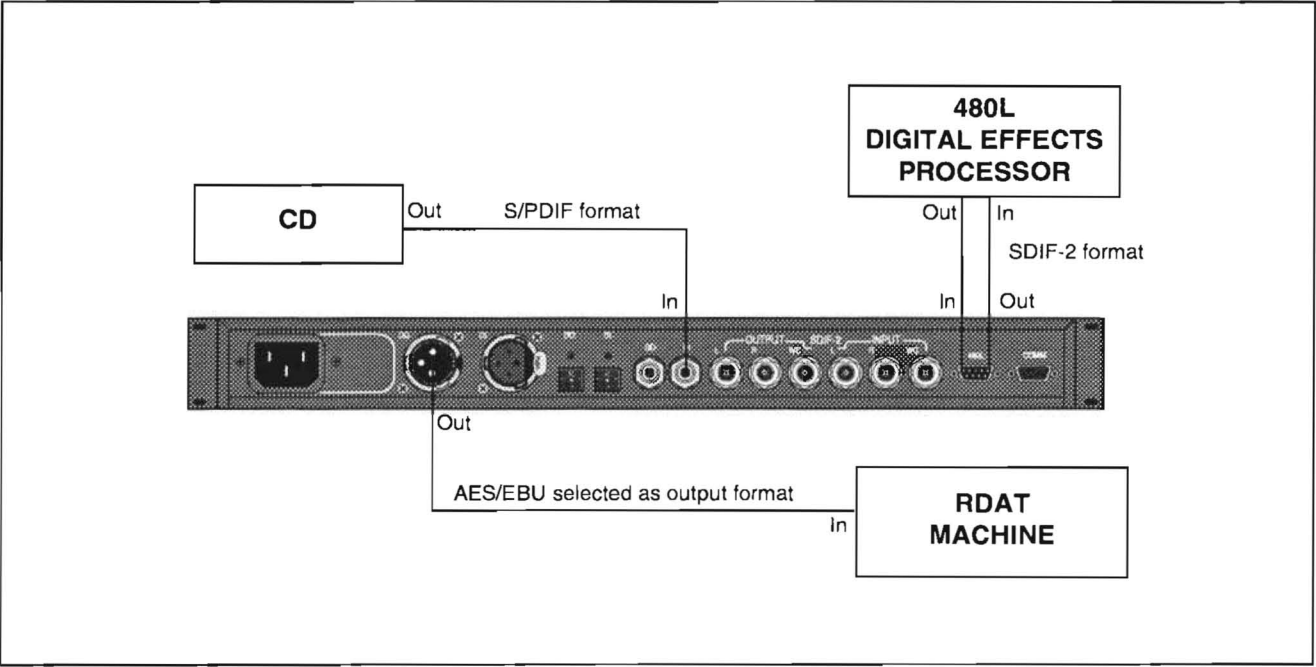
Following are some sample hookup diagrams showing typical interconnections in various bidirectional modes.



*Bidirectional Conversion:  
AES/EBU to SDIF-2 to AES/EBU*

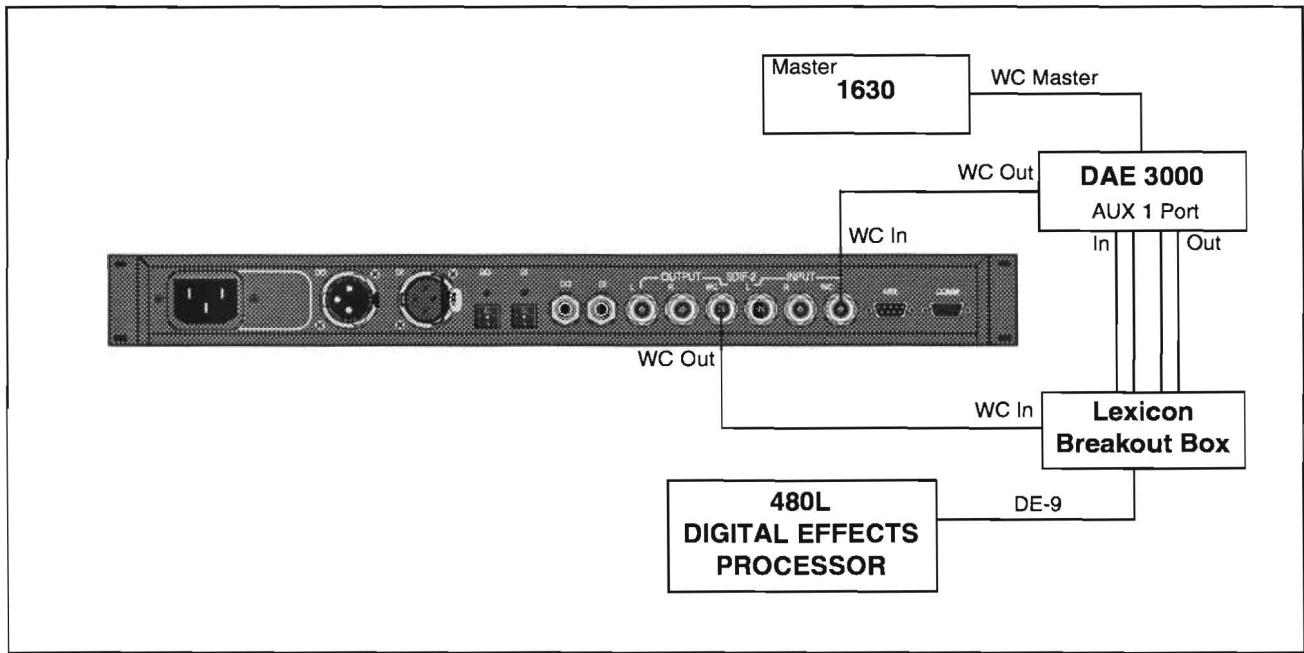


*Bidirectional Conversion:  
SDIF-2 to AES/EBU to SDIF-2*

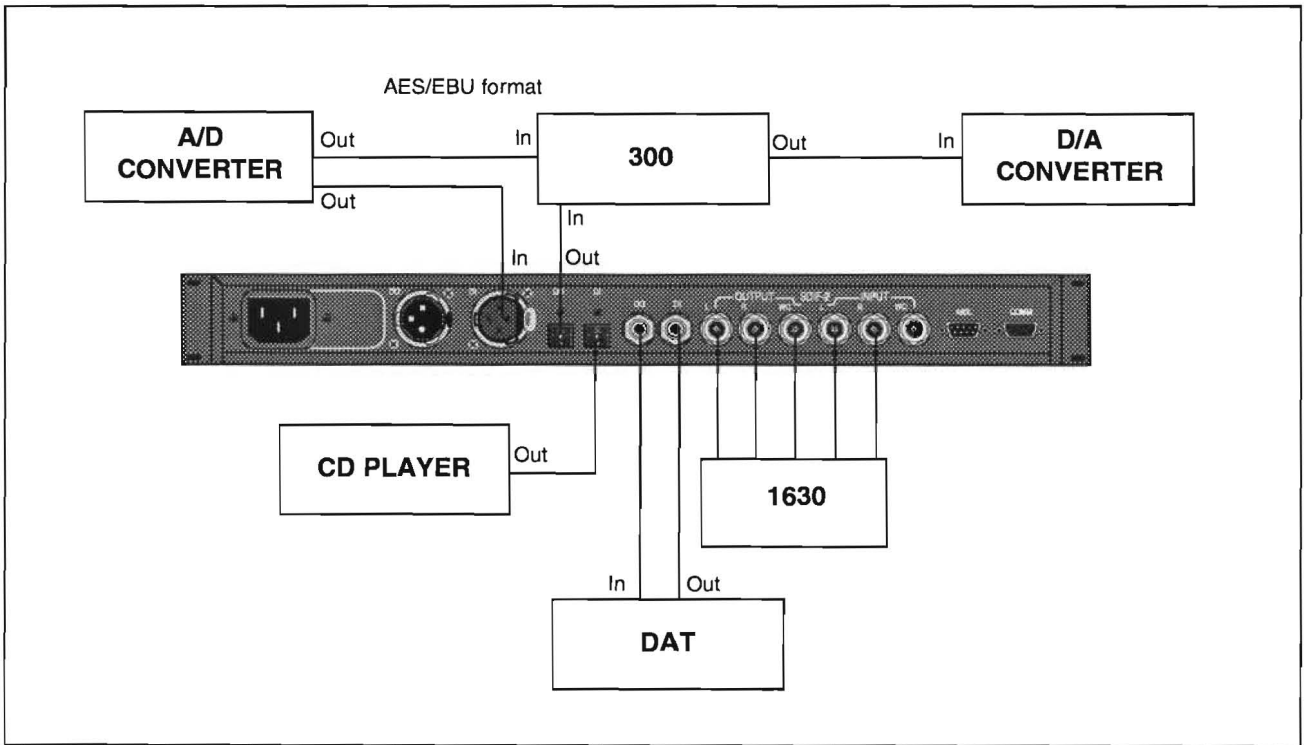


*Bidirectional Conversion:  
S/PDIF to SDIF-2 to AES/EBU*

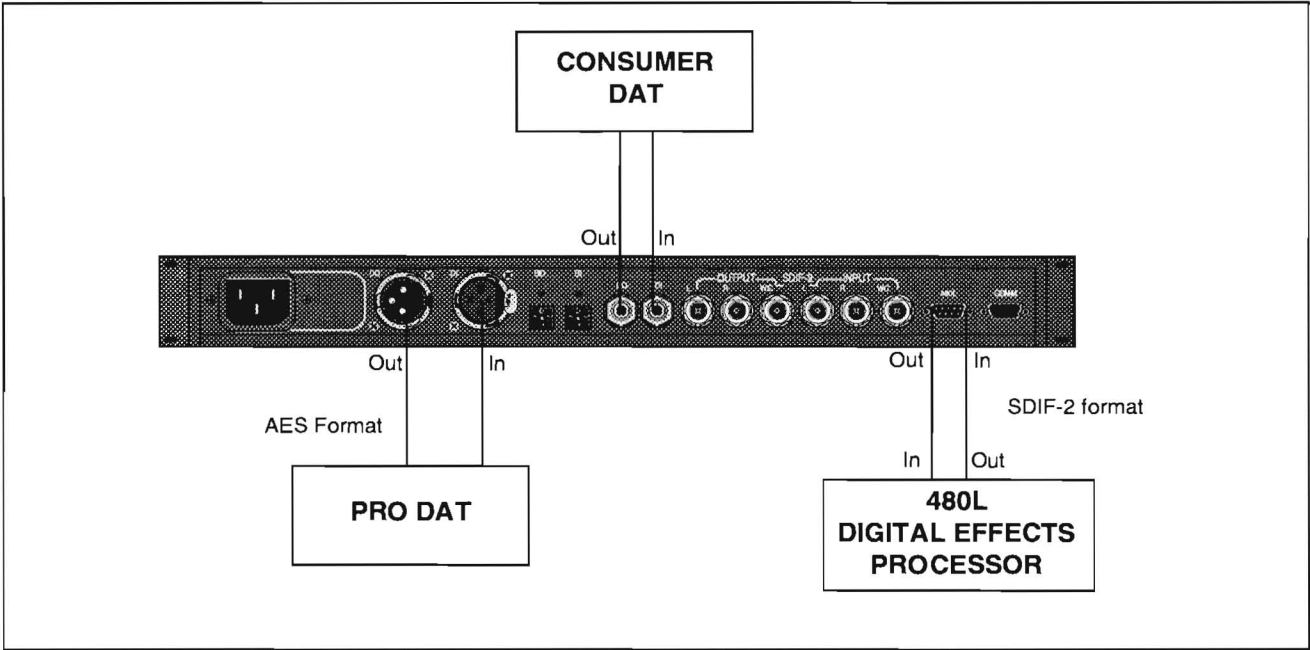




Word Clock delay in  
CD Mastering/music editing setup,  
using 480L as DSP



Location or studio recording on 1630  
and DAT with CD player reference  
and digital switching of  
playback signal



DAT to DAT copy via AES or S/PDIF with bidirectional conversion to SDIF-2 for DSP with 480L

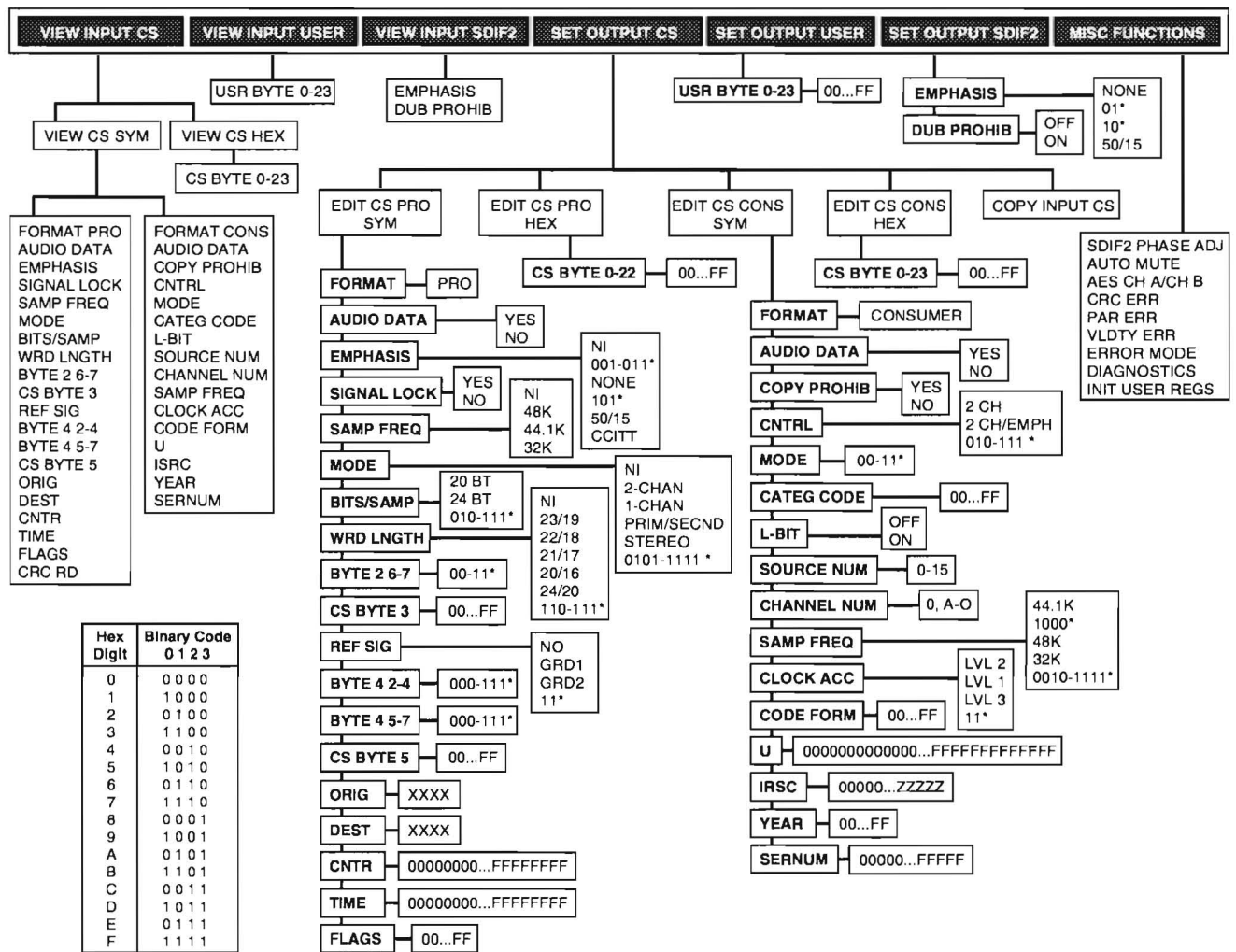
## Navigating the Menu

All of the LFI-10 menu choices are accessed from the front-panel MENU FUNCTIONS section. Use the Scroll knob or the arrowed keys to access the main menu selections. These selections allow you to view incoming data, alter outgoing data, or access additional functions. The LFI-10 allows viewing of all the auxiliary data embedded in a digital audio data stream received on a given input and will allow editing of the auxiliary data to be transmitted on a digital audio data stream. For the AES-type data streams this auxiliary data consists of 24 bytes of Channel Status data and 24 bytes of User data. For the SDIF-2 data stream this auxiliary data consists of Emphasis and Dub Prohibit bits.

A graphic representation of the menu choices is shown on the following page. Each main menu category will be detailed further in the following sections.

In general, pressing ENTER with any menu item displayed will access that item's sub-menu. In each sub-menu the procedure is the same — scroll to any item, then press ENTER to view additional submenus. When alphanumeric entry is required, the Scroll knob selects from the available characters, the arrowed keys move you to another character location. At the deepest menu level, pressing ENTER will activate your selection. Pressing CANCEL will step you back one level. Pressing CANCEL repeatedly will return you to the main menu level.

## LFI-10 Menu Controls



\* Menu items marked with an asterisk are currently undefined.



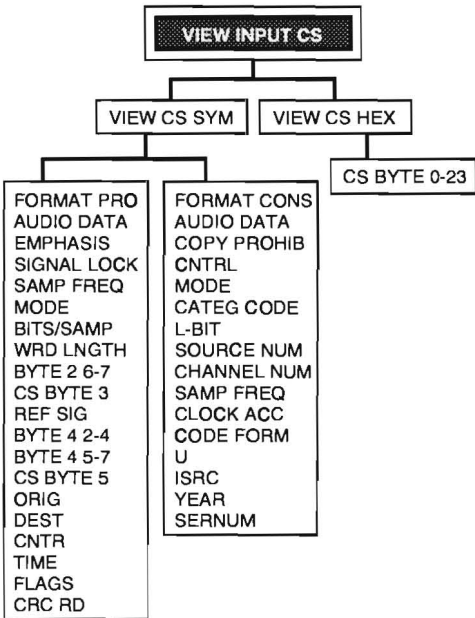
**Viewing the Incoming Data**

The first three menu items (VIEW INPUT CS, VIEW INPUT USER and VIEW INPUT SDIF2) allow detailed viewing of the auxiliary data embedded in the incoming audio signal. From these menus you can determine the current settings of the data you will be altering in the "set output" menus. To access any of the "view" menus, simply turn the Scroll knob to select the item you want to view, and press ENTER. The display will immediately show the first item in the submenu of the selected item.

Note: If there is no AES or S/PDIF input signal to view, the LFI-10 will display "NO INPUT" when you select VIEW INPUT CS or VIEW INPUT USER. The VIEW INPUT SDIF2 menu is available on the display regardless of the presence of a valid SDIF-2 input signal — the menu items will be shown at their default settings.

**Channel Status**

When you select VIEW INPUT CS, the LFI-10 confirms that there is an active AES or S/PDIF input. (If not, "NO INPUT" is displayed.) If a valid input signal is detected, the LFI-10 automatically detects the format (pro or consumer) of the input data and lights the appropriate front panel status LED (AES/EBU or S/PDIF). If you have selected a unidirectional mode with an SDIF-2 input, neither of the format LEDs will be lit. To view the Channel Status block, simply press ENTER to enter the first Channel Status Input sub-menu which allows you to choose to view the data symbolically, or in hex.



Front panel LEDs display the sample rate of the master input signal. The frequency of the incoming sample rate is measured. If it matches one of the four frequencies on the front panel (48Khz, 44.1Khz, 44.056Khz or 32Khz) the corresponding LED is lit, otherwise, no LEDs are lit. If the *measured* frequency of the frame rate does not match the frequency indicated in the channel status block, this LED will flash.

The SIG PRES and SIG LOCK LEDs are only valid for active AES-type inputs. The SIG PRES LED is lit when a valid input signal is detected on the selected input connector. (A valid input signal is assumed to be present if the auxiliary data blocks are being correctly received on the selected input.) The SIG LOCK LED indicates whether the phase lock loop has locked onto the incoming selected word clock.

Front panel LEDs also indicate the settings of COPY PROHIBIT, and EMPHASIS bits in the AES Channel Status block. (The settings of these LEDs are derived from the AES data stream, not the SDIF-2 data stream.)

Three front-panel Error LEDs indicate the detection of various error states in the incoming AES data stream.

- CRCC indicates a Cyclic Redundancy Check error in the incoming channel status data.
- PARITY indicates a parity error in the incoming data.
- VALIDITY indicates that the VALIDITY bit was set in a frame of incoming data.

These LEDs can be set to flash on occurrence of errors, or to stay lit on the first error detection. Error counter reset and selection of LED mode are accessed from the MISC FUNCTIONS menu.

To access all 24 bytes of the Channel Status data block symbolically, scroll to VIEW CS SYM, then press ENTER . The Scroll knob now allows you to view each item and its current setting. To view Channel Status data in hex format, select VIEW CS HEX, then press ENTER.

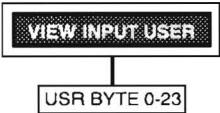
If the ENTER key is pressed while displaying any menu item, the LFI-10 re-reads the 24 bytes of data from the input data stream.

The LFI-10 dynamically updates items in the Channel Status block. If the input signal changes while you are in the VIEW INPUT CS menu, a message will flash on the display to indicate "FORMAT CHANGE", and you will be returned to the VIEW INPUT CS display. If the input is removed, a message indicating NO INPUT will flash on the display and you will be popped up one menu level.

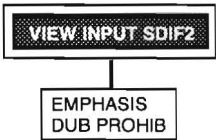
Provision is made in the AES and S/PDIF data stream for the inclusion of any additional data which a manufacturer might want to provide. The format of this data is standardized, but within this format, manufacturers are free to transmit any type of data they want. If data is available here, the LFI-10 allows you to view it in hex under the VIEW INPUT USER menu, and to alter it in the SET OUTPUT USER menu. Specific information on any data in this field must be obtained directly from the manufacturer of the equipment transmitting or expecting such data.

To view the User data embedded in an incoming AES or S/PDIF data stream, select VIEW INPUT USER from the main menu, then press ENTER.

User Data



**SDIF-2 Data**



The only auxiliary information available in the SDIF-2 data stream is the setting of emphasis and dub prohibit bits. To view the settings of these bits in an incoming SDIF-2 signal, select VIEW INPUT SDIF2 from the main menu, then press ENTER.

The LFI-10 does not perform automatic signal detection on the SDIF-2 inputs. Consequently, the VIEW INPUT SDIF2 menu can be viewed even when no SDIF-2 signal is present. The menu items are shown at their default settings.

Phase adjustment of SDIF-2 timing references is available under the MISC FUNCTIONS menu.

**Specifying the Output Data**

Three menu items (SET OUTPUT CS, SET OUTPUT USER and SET OUTPUT SDIF2) allow you to alter the auxiliary data embedded in the incoming audio signal. Changes you make in these menus will determine the data output by the LFI-10. Before selecting any of these menus, make sure you have correctly specified the output format you want.

**Selecting the Output Format**

The front-panel OUTPUT SELECT button allows you to select the format of the Channel Status data available at the AES and S/PDIF outputs (and in the output menu), or to pass the auxiliary information from an AES input through unchanged. OUTPUT SELECT is always active, even when you are deep in the LFI-10 menu.

The choices available by pressing OUTPUT SELECT are:

- LOOP-THRU    AES Channel Status information will be passed through unchanged
- AES/EBU      Channel Status information will be output in the AES professional format
- S/PDIF        Channel Status information will be output in the S/PDIF consumer format

One of the three LEDs next to the output SELECT button will be lit to indicate the current setting of the output mode. Identical digital data is always transmitted on the AES and S/PDIF connectors (XLR, RCA, and OPTO)

⚡ The COPY PROHIBIT and EMPHASIS LEDs in the output section will indicate the current setting of those bits in the output AES data stream.

The output data is automatically muted if the selected input AES data stream is not present. An LED (labeled MUTE) in the output section is lit when output data is being muted. The auto-mute feature can be disabled through the MISC FUNCTIONS menu.



To access any of the data alteration menus, simply turn the Scroll knob to select the item you want, and press ENTER. The display will immediately show the first item in the submenu of the selected item.

### Altering the Output Data

The LFI-10 makes full submenus available in each of the data alteration menus *whether or not an appropriate input signal is present*. These are initially loaded with default settings for each menu item, thereafter, the settings will reflect those of the preset or register last used. These settings will *not* automatically match your input data.

#### Note

Remember that the current status of many of the items you will want to alter is available through the front-panel status LEDs. These provide information that will often eliminate unnecessary switching back and forth between the viewing and alteration menus.

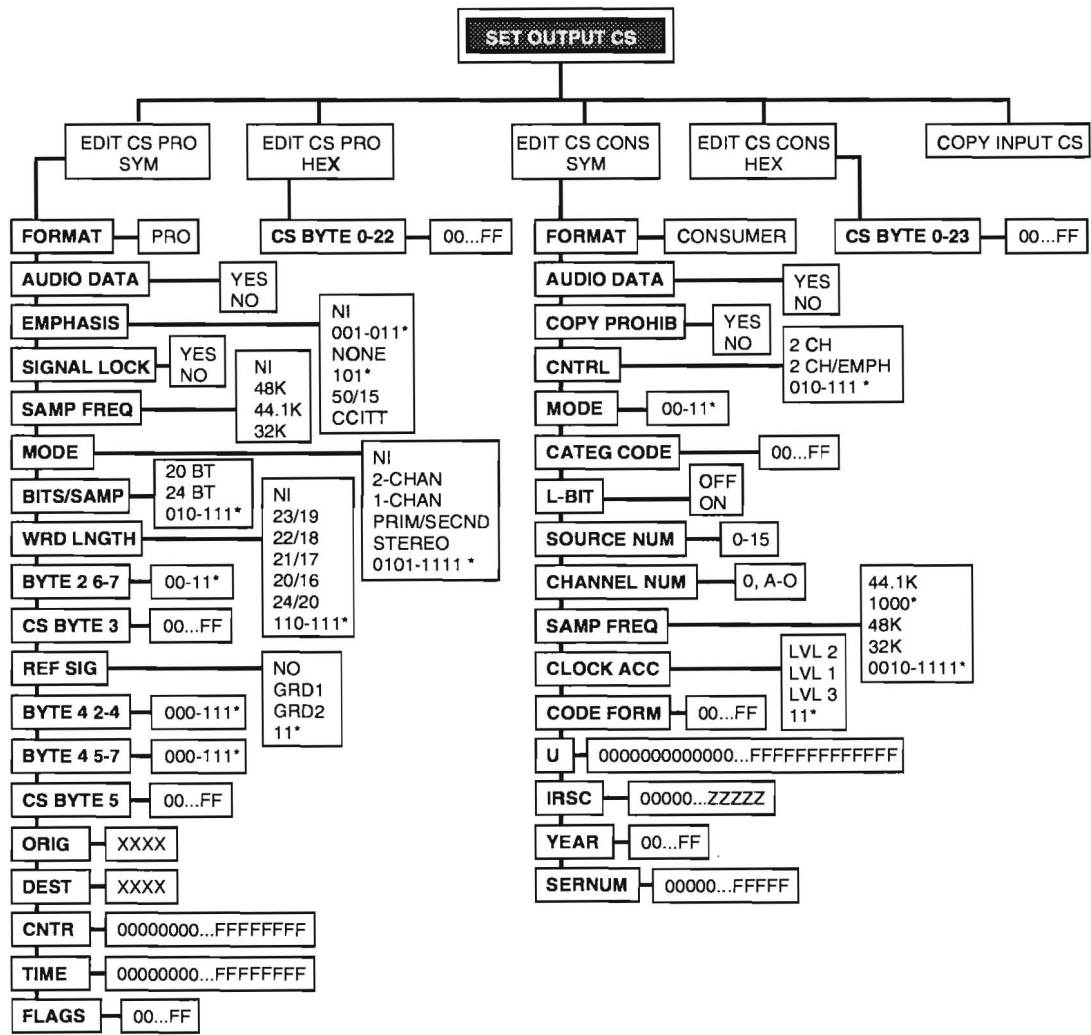
If you have a valid AES or S/PDIF input signal, the appropriate front-panel status LED (AES/EBU or S/PDIF) should be lit, as well as the SIG PRES. LED. LEDs also display the inputs you have selected, the signal you have selected as the master in bidirectional modes, and the sample rate of the master input signal as well as whether or not the LFI-10 has locked onto the incoming signal. Front panel LEDs also indicate the settings of COPY PROHIBIT, and EMPHASIS bits in the AES Channel Status block and error states in the incoming AES data stream.



**Altering AES and S/PDIF Channel Status Data**

Any of the information embedded in the Channel Status block of an AES or an S/PDIF signal can be altered through the LFI-10 menu. To access the Channel Status edit menus, scroll to SET OUTPUT CS and press ENTER.

The SET OUTPUT CS submenu allows you to copy the input data and to edit the output data in either the professional or consumer format. Editing can be performed symbolically, or in hex. The Scroll knob lets you select any of these options, pressing ENTER will bring up the submenus shown below.



Remember that the LFI-10 makes *both* formats of Channel Status blocks (pro and consumer) available for editing under the SET OUTPUT CS menu. **Which one of these is actually transmitted by the LFI-10 is determined by your choice of Output format at the front panel.**

It is important to note that the Channel Status blocks which are available under the SET OUPUT CS menu are initially loaded with default settings for each menu item, as shown in the graphic below. Thereafter, the settings of these blocks will reflect those of the setup (or preset or register) last used. These settings will **NOT** automatically match your input data.

DEFAULT CS BLOCKS	
EDIT CS PRO	
FORMAT PRO	
AUDIO DATA	YES
EMPHASIS	NI
SIGNAL LOCK	YES
SAMP FREQ	NI
MODE	NI
BITS/SAMP	20
WRD LGTH	NI
BYTE 2 6-7	00
CS BYTE 3	00
REF SIG	NO
BYTE 4 2-4	000
BYTE 4 5-7	000
CS BYTE 5	00
ORIG	null
DEST	null
CNTR	00000000
TIME	00000000
FLAGS	00
EDIT CS CONS	
FORMAT CONS	
AUDIO DATA	YES
COPY PROHIB	YES
CNTRL	2 CH
MODE	00
CATEG CODE	00
L-BIT	OFF
SOURCE NUM	0
CHANNEL NUM	0
SAMP FREQ	44.1K
CLOCK ACC	LVL 2
CODE FORM	00
U	00000000000000
ISRC	00000
YEAR	00
SERNUM	00000

If you are going to edit incoming data, first scroll to COPY INPUT CS and press ENTER. This copies the entire input Channel Status block so that you can modify only certain fields while leaving others identical to the input state. (This is also a convenient way to return the Channel Status block menus to a known state, i.e. identical to the incoming data.) The LFI-10 display will flash "COPY TO PRO BLK" or "COPY TO CONS BLK" to indicate the format of the incoming signal that is being copied.

To make modifications (symbolically) to the Channel Status block that was copied, scroll to the EDIT CS PRO SYM or EDIT CS CONS SYM menu, depending on the format of the block that was copied.

Press ENTER to display the first of the available submenu choices. Pressing ENTER again will cause an arrow to appear on the display indicating that the item has been selected for alteration. The Scroll knob will move you through all of the available Channel Status block settings for that item. Pressing ENTER with any selection displayed will set your selection and cause the displayed arrow to disappear.

Pressing CANCEL will always restore you to the previous menu step. Pressing CANCEL repeatedly will step you back through the menu.

The following section gives a brief description of each of the menu items available in the symbolic SET OUTPUT CS pro and consumer menus. Following each set of descriptions is a reference table showing a summary of the currently legal settings for each item.

Each menu item is labeled in accordance with digital audio specifications available at the time of publication of this manual. In the symbolic menu, defined settings have been calculated and made available as a simple series of named settings. Functions which are currently unassigned are marked with an asterisk and described in these tables as "undefined". Many of these have been reserved for future assignment by the standards committees. Access to these items is still available in the symbolic menu but requires hex or ASCII entry. Caution is advised in altering any of these menu items without a thorough understanding of their function, the effect on byte settings, and reference to the latest published specifications.

At the end of this chapter we have provided Channel Status reference charts which show the byte structure of the output formats. This reference is intended primarily for those who will be dealing with hex entry of Channel Status information. Additional information for the hex user is provided throughout the descriptions — where binary information is included, please refer to the tables for bit organization.

**AES (pro format)  
Channel Status  
Menu Selections**

**FORMAT**  
This menu item is not available for selection, but is a label which identifies the Channel Status block as conforming to the AES professional format. The LFI-10 automatically sets the identifying bit to match your menu selection and displays the label PRO.

**AUDIO DATA**  
The AES specification provides for the identification of transmitted data as being audio or non-audio data. The choices are presented as Audio Data: YES or NO.

**EMPHASIS**  
These settings are intended to label some defined types of emphasis, and to specify whether or not emphasis has been performed on the audio signal. The available settings are as follows:  
NI: Emphasis not indicated. The receiving device will default to no emphasis, but this setting does not prohibit later resetting of the emphasis bits.  
001\*-011\*: These settings are undefined, but reserved. No label has been assigned to these bit states as of this writing.  
NONE: This setting specifies no emphasis, and prohibits later resetting of the emphasis bits.  
101\*: This setting is undefined, but reserved. No label has been assigned to this bit state as of this writing.  
50/15: This setting specifies 50/15µs emphasis, and prohibits later resetting of the emphasis bits.  
CCITT: This setting specifies CCITT J.17 emphasis (w/6.5dB insertion loss at 800Hz)



**SIGNAL LOCK**

YES: Default and source sampling frequency locked  
NO: Source sampling frequency unlocked

Note: This is unrelated to the SIG LOCK status LED on the LFI-10 front panel, which lights when an input AES-type signal is locked onto by the LFI-10 circuitry.

**SAMP FREQ**

These settings are intended to identify the original sampling frequency of the audio data. The available settings are:

NI: Sampling frequency not indicated. The receiving device will default to 48kHz, manual override enabled  
48K: 48kHz sampling frequency, manual override disabled  
44.1K: 44.1kHz sampling frequency, manual override disabled  
32K: 32kHz sampling frequency, manual override disabled

Note: The LFI-10 measures the actual sampling frequency of incoming data. If there is a mismatch between the measured frequency and the frequency specified here, the front panel LED will flash.

**MODE**

These settings specify the original channel mode encoding as follows:

NI: mode not indicated, receiver default to 2-channel mode  
2-CHAN: 2-channel mode, manual override disabled  
1-CHAN: single channel mode (monophonic), manual override disabled  
PRIM/SECND: primary/secondary mode (channel 1 is primary), manual override disabled  
STEREO: stereophonic mode (channel 1 is left channel), manual override disabled  
0101\*-1111\*: These settings are undefined, but reserved. No label has been assigned to these bit states as of this writing.

**NOTE:** All of the information described above, along with four bits reserved for User management, are carried in the first two bytes of the Channel Status block. This information should be transmitted by any device which implements Channel Status. If Channel Status is not implemented, all of the foregoing data is to be set to logical "0", causing the receiver to default to 48kHz sampling frequency, in 2-channel mode, with 20-bit audio sample data and no emphasis assumed. In this state, no communication from a device transmitting data in the consumer format can be received.



**BITS/SAMP**

These settings specify the use of auxiliary bits which may or may not be incorporated into the audio sample word. The available settings are:

20: The audio sample word length is 20 bits. The use of auxiliary sample bits is not defined.

24: The audio sample word length is 24 bits. The auxiliary sample bits are used for main audio sample data

010\*-111\*: These settings are undefined, but reserved. No label has been assigned to these bit states as of this writing.

**WRD LGTH**

These settings describe the encoded audio sample word length source word length. The word length is dependent on the settings above, under BITS/SAMP. The available settings are:

NI: The word length is not indicated. This default state indicates that the number of active bits within the range of 20 or 24 bits is not specified by the transmitter. The receiver should default to the maximum number of bits allowable and enable manual override.

23/19: If maximum word length is 24 bits; audio sample word length is 23 bits.  
If maximum word length is 20 bits; audio sample word length is 19 bits.

22/18: If maximum word length is 24 bits; audio sample word length is 22 bits.  
If maximum word length is 20 bits; audio sample word length is 18 bits.

21/17: If maximum word length is 24 bits; audio sample word length is 21 bits.  
If maximum word length is 20 bits; audio sample word length is 17 bits.

20 /16: If maximum word length is 24 bits; audio sample word length is 20 bits.  
If maximum word length is 20 bits; audio sample word length is 16 bits.

24/20: If maximum word length is 24 bits; audio sample word length is 24 bits.  
If maximum word length is 20 bits; audio sample word length is 20 bits.

110-111\*: These settings are undefined, but reserved. No label has been assigned to these bit states as of this writing.

**BYTE 2 6-7**

00-11\*: These settings are undefined, but reserved. No label has been assigned to these bit states as of this writing.

**CS BYTE 3**

These bits are reserved for future use to describe multichannel function. Hex entry is available (00...FF), but these bits should be set to logic "0" as of this writing.

**REF SIG**

These settings describe a digital audio reference signal defined by AES. The available settings are:

NO: Not a digital audio reference signal. (This is the default setting.)

GRD 1: Identifies a grade 1 reference signal

GRD 2: Identifies a grade 2 reference signal

11\*: This setting is undefined, but reserved.

BYTE4 2-4

000-111\*: The settings of Byte 4, bits 2-4 are undefined, but reserved.

BYTE4 5-7

000-111\*: The settings of Byte 4, bits 5-7 are undefined, but reserved.

CS BYTE 5

This byte is reserved. Hex entry is available (00...FF), but these bits should be set to logic "0" as of this writing.

ORIG

Four characters of alphanumeric channel origin data can be provided here. The symbolic menu makes many, but not all of the legal ASCII characters available. Hex entry provides access to all ASCII characters, including illegal entries. The table below illustrates those entries which are legal; those which are not available in the symbolic menu are shaded.

Hex user note: The first character in the message is byte 6. Bits 0-7 of each byte are ASCII data with no parity bit. LSBs are transmitted first with logic "0" in bit 7. The default value is logic "0" (code 00 hex, ASCII null).

DEST

Four characters of alphanumeric channel origin data can be provided here. The symbolic menu makes many, but not all of the legal ASCII characters available. Hex entry provides access to all ASCII characters, including illegal entries. The table below illustrates those entries which are legal; those which are not available in the symbolic menu are shaded.

Hex user note: The first character in the message is byte 6. Bits 0-7 of each byte are ASCII data with no parity bit. LSBs are transmitted first with logic "0" in bit 7. The default value is logic "0" (code 00 hex, ASCII null).

Legal ASCII Characters and Corresponding Hex Digits											
(shaded sections indicate characters which are not available via the LFI-10 symbolic menu)											
ASCII	Hex	ASCII	Hex	ASCII	Hex	ASCII	Hex	ASCII	Hex	ASCII	Hex
None	00	/	2F	?	3F	O	4F		5F	o	6F
Space	20	0	30	@	40	P	50		60	p	70
!	21	1	31	A	41	Q	51	a	61	q	71
"	22	2	32	B	42	R	52	b	62	r	72
#	23	3	33	C	43	S	53	c	63	s	73
\$	24	4	34	D	44	T	54	d	64	t	74
%	25	5	35	E	45	U	55	e	65	u	75
&	26	6	36	F	46	V	56	f	66	v	76
'	27	7	37	G	47	W	57	g	67	w	77
(	28	8	38	H	48	X	58	h	68	x	78
)	29	9	39	I	49	Y	59	i	69	y	79
*	2A	:	3A	J	4A	Z	5A	j	6A	z	7A
+	2B	;	3B	K	4B	[	5B	k	6B	{	7B
,	2C	<	3C	L	4C	\	5C	l	6C		7C
-	2D	=	3D	M	4D	]	5D	m	6D	}	7D
.	2E	>	3E	N	4E	^	5E	n	6E	~	7E

Due to display limitations, the ASCII characters : (colon) and ; (semicolon) will appear on the display as spaces. Their hex equivalents, however, are correctly registered.

**CNTR**

These bits are assigned to carry a 32-bit binary local sample address code. This has the same function as a recording index counter. Entry is in hex (00 00 00 00... FF FF FF FF). Value is of first sample of current block, bits 0-7 each byte are transmitted LSB first. Transcoding of the binary number to any conventional time code requires accurate sample frequency information to provide a sample accurate time.

Note: The LFI-10 does not generate a dynamic Sample Address Code. It can only be set statically. The output of an AES device containing dynamic SAC can only be transmitted through the LFI-10 in LOOP-THRU mode.

**TIME**

These bits are assigned to carry a 23-bit binary time-of-day sample address code. Entry is in hex (00 00 00 00...FF FF FF FF). Bits 0-7 each byte are transmitted LSB first.

NOTE: This is the time of day laid down during the source encoding of the signal and remains unchanged during subsequent operations.

**FLAGS**

This identifies whether the information carried by the Channel Status data is reliable. Entry is by hex (00...FF). If reliable, the bits are set to logic "0" (default); if unreliable, bits are set to logic "1" as follows:

- bits 0-3: reserved and set to logic "0" until further defined
- bit 4: bytes 0-5
- bit 5: bytes 6-13
- bit 6: bytes 14-16
- bit 7: bytes 18-21



AES (pro format) Channel Status Menu Selections

Menu Item	Settings	Description
FORMAT	PRO	identifies block as AES professional format
AUDIO DATA	YES NO	normal audio mode non audio mode
EMPHASIS	NI 001-011* NONE 101* 50/15 CCITT	Emphasis not indicated. rcvr default to no emphasis; manual override enabled undefined no emphasis, manual override disabled undefined 50/15µs emphasis, manual override disabled CCITT J.17 emphasis (w/6.5dB insertion loss at 800Hz)
SIGNAL LOCK	YES NO	default and source sampling frequency locked source sampling frequency unlocked
SAMP FREQ	NI 48K 44.1K 32K	sampling frequency not indicated, rcvr default to 48kHz, manual override enabled 48kHz sampling frequency, manual override disabled 44.1kHz sampling frequency, manual override disabled 32kHz sampling frequency, manual override disabled
MODE	NI 2-CHAN 1-CHAN PRIM/SECND STEREO 0101-1111*	mode not indicated, receiver default to 2-channel mode 2-channel mode, manual override disabled single channel mode (monophonic), manual override disabled primary/secondary mode (channel 1 is primary), manual override disabled stereophonic mode (channel 1 is left channel), manual override disabled undefined
BITS/SAMP	20 24 010-111*	20-bit audio sample word length, auxiliary sample bits use not defined 24-bit audio sample word length, auxiliary sample bits used for main audio sample data undefined
WRD LNGTH	NI 23/19 22/18 21/17 20/16 24/20 110-111*	word length not indicated word length in bits if maximum word length is 24/20 " " " " undefined
BYTE 2 6-7	00*-11*	undefined
CS BYTE 3	00...FF	undefined
REF SIG	NO GRD 1 GRD 2 11*	not a digital audio reference signal (default) grade 1 reference signal grade 2 reference signal undefined
BYTE4 2-4	000-111*	undefined
BYTE4 5-7	000-111*	undefined
CS BYTE 5	00...FF	undefined
ORIG	XXXX	alphanumeric channel origin data, first character in message is byte 6, bits 0-7 each byte -- ASCII data with no parity bit, LSB first; nonprinted control characters (codes 01-1Fhex and 7F hex) are not permitted
DEST	XXXX	alphanumeric channel destination data, first character in message is byte 10, bits 0-7 each byte -- ASCII data with no parity bit, LSB first; nonprinted control characters (codes 01-1Fhex and 7F hex) are not permitted
CNTR	00 00 00 00... FF FF FF FF	32-bit binary local sample address code, value is of first sample of current block bits 0-7 each byte -- LSB first NOTE: transcoding of the binary number to any conventional time code requires accurate sample frequency information to provide a sample accurate time.
TIME	00 00 00 00... FF FF FF FF	23-bit binary time-of-day sample address code, bits 0-7 each byte -- LSB first
FLAGS	00...FF	data reliability flags; set to 0 (default) if reliable; set to 1 if unreliable bits 0-3: undefined/bit 4: bytes 0-5/bit 5: bytes 6-13/bit 6: bytes 14-16/bit 7: bytes 18-21



**S/PDIF (cons format)  
Channel Status  
Menu Selections**

**FORMAT**  
This menu item is not available for selection, but is a label which identifies the Channel Status block as conforming to the S/PDIF consumer format. The LFI-10 automatically sets the identifying bit to match your menu selection and displays the label CONS.

**AUDIO DATA**  
The AES specification provides for the identification of transmitted data as being audio or non-audio data. The choices are presented as Audio data: YES or NO.

**COPY PROHIB**  
The setting of this item specifies whether or not digital copy prohibit bits are set. The setting of this bit also determines whether or not the "L-bit" (which identifies original program material and allows or prohibits its copying) is active. The available choices are:  
YES: digital copy prohibited (L-bit is active)  
NO: digital copy permitted (L-bit is inactive)

**CNTRL**  
This setting provides identification of channel and emphasis. The available settings are:  
2 CH: 2 audio channels without pre-emphasis  
2 CH/EMPH: 2 audio channels with 50/15µs pre-emphasis  
010-111\*: These settings are undefined, but reserved. No label has been assigned to these bit states as of this writing.

**MODE**  
00-11\*: These settings are undefined, but reserved. No label has been assigned to these bit states as of this writing.

**NOTE:** All of the information described above is carried in the first byte of the Channel Status block. Hex users note that emphasis and copy prohibit functions are carried in bits 1-5. The legal settings are as follows:

0X000	2 audio channels without pre-emphasis
0X100	2 audio channels with 50/15µs pre-emphasis
1X000	digital (non-audio) data
X0XXX	digital copy prohibited
X1XXX	digital copy permitted

**CATEG CODE**  
These settings identify certain types of equipment. The defined choices are:

hex		
00	0000 0000	2-channel general format
01	1000 0000	2-channel Compact Disc player
02	0100 0000	2-channel PCM encoder/decoder
03	1100 0000	2-channel Digital Audio Tape Recorder

All other settings are undefined and not permitted as of this writing.

**L-BIT**

This bit provides for limiting of digital copies. It is part of the Serial Copy Management System (SCMS) currently proposed as a requirement of digital recorders. When Copy Prohibit is set to YES, the "L-bit" (bit 7 of byte 1 in the Channel Status block) provides toggle control of copy prohibit, or single-copy permission.

OFF: digital copying of original program material prohibited

ON: digital copying of original program material permitted

**SOURCE NUM**

Entry is in decimal values (0-15). Binary equivalents are shown to the right.

don't care	0000
1	1000
2	0100
3	1100
•	•
•	•
•	•
15	1111

**CHANNEL NUM**

These settings identify the audio channel.

0: don't care

A: left channel for 2-channel format

B: right channel for 2-channel format

All other settings are undefined as of this writing.

**SAMP FREQ**

44.1K: 44.1kHz sampling frequency

48 K: 48kHz sampling frequency

32K: 32kHz sampling frequency

1100-1111\*: These settings are undefined, but reserved. No label has been assigned to these bit states as of this writing.

Note: The LFI-10 measures the actual sampling frequency of incoming data. If there is a mismatch between the measured frequency and the frequency specified here, the front panel LED will flash.

**CLOCK ACC**

Several levels of clock accuracy have been defined. The available choices are:

LVL 2: Normal accuracy mode; all receivers should receive a signal of  $\pm 1000 \times 10^{-6}$  of nominal sampling frequency

LVL 1: High accuracy mode; tolerance of transmitted sampling frequency  $\pm 50 \times 10^{-6}$

LVL 3: Variable pitch shifted clock mode (for specially designed receivers)

11\*: undefined

**CODE FORM**

Bits 32 (MSB)-39(LSB) have been assigned to carry UPC/EAN, ISRC coding mode information. This setting requires hex entry (00...FF).

U

This menu item provides for entry of the catalog number of the program software expressed in 13 digits (BCD).

ISRC

This menu item allows entry of five characters of the 12-character ISRC code. The first two characters represent the country code; characters 3-5 represent the owner code. See table at the end of this section.

YEAR

This item is for hex entry (00...FF) of the year of recording; digits are 4-bit BCD numbers

SERNUM

This item is for hex entry (00000...FFFFFF) of the serial number of the recording; digits are 4-bit BCD numbers.

NOTE: The LFI-10 symbolic menu breaks out the YEAR and SERIAL NUMBER portions of the ISRC code to allow simple symbolic entry. Hex users note the entire ISRC code consists of 12 characters specified as follows:

- characters 1-2: country code, each character is 6 bits, coded according to the coding table shown
- characters 3-5: owner code, each character is 6 bits, coded according to the coding table shown
- characters 6-7: year of recording, digits are 4-bit BCD numbers
- characters 8-12: serial number of the recording, digits are 4-bit BCD numbers

bit organization is as follows:

- Byte 14 bits 4-7
- Bytes 15-17 bits 0-7 } country and owner
- Byte 18 bits 0-1
- Byte 18 bits 2-3 } undefined
- Byte 18 bits 4-7
- Bytes 19-21 bits 0-7 } year and serial number

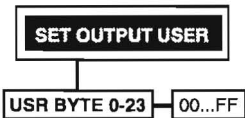
Coding Table	
0	000000
1	000001
2	000010
3	000011
4	000100
5	000101
6	000110
7	000111
8	001000
9	001001
A	010001
B	010010
C	010011
D	010100
E	010101
F	010110
G	010111
H	011000
I	011001
J	011010
K	011011
L	011100
M	011101
N	011110
O	011111
P	100000
Q	100001
R	100010
S	100011
T	100100
U	100101
V	100110
W	100111
X	101000
Y	101001
Z	101010

S/PDIF (cons format) Channel Status Menu Selections

Menu Item	Settings	Description
FORMAT	CONS	identifies block as AES consumer format
AUDIO DATA	YES	normal audio mode
	NO	non audio mode
COPY PROHIB	YES	digital copy prohibited (L-bit active)
	NO	digital copy permitted (L-bit inactive)
CNTRL	2 CH	2 audio channels without pre-emphasis
	2 CH/EMPH	2 audio channels with 50/15µs pre-emphasis
	010-111*	undefined
MODE	00-11*	undefined
CATEG CODE	00...FF	category code; bits 8(LSB)-15(MSB), 20 bits/sample max, MSB fixed at position 27. All settings other than those listed are undefined and not permitted as of this writing
	00 0000 0000	2-channel general format
	01 1000 0000	2-channel Compact Disc player
	02 0100 0000	2-channel PCM encoder/decoder
	03 1100 0000	2-channel Digital Audio Tape Recorder
L-BIT	OFF	digital copying of original program material prohibited
	ON	digital copying of original program material permitted
SOURCE NUM	0-F	source number
CHANNEL NUM	0	don't care
	A	left channel for 2-channel format
	B	right channel for 2-channel format
		all other setting are undefined
SAMP FREQ	44.1K	44.1kHz sampling frequency
	48 K	48kHz sampling frequency
	32K	32kHz sampling frequency
	1100-1111*	undefined
CLOCK ACC	LVL 2	normal accuracy mode; all receivers should receive a signal of $+1000 \times 10^{-6}$ of nominal sampling frequency
	LVL 1	high accuracy mode; tolerance of transmitted sampling frequency $+50 \times 10^{-6}$
	LVL 3	variable pitch shifted clock mode (for specially designed receivers
	11*	undefined
CODE FORM	00...FF	byte 4: bits 32(MSB) bit 39(LSB); 1xxx xxxx UPC/EAN, ISRC coding mode/0xxx xxxx undefined
U	00000000000000...	UPC/EAN code
	FFFFFFFFFFFFFFF	catalog number of the program software expressed in 13 digits; 4-bit BCDnumbers
ISRC	00000...ZZZZ	5-characters of the 12-character ISRC code characters 1-2: country code characters 3-5: owner code
YEAR	00...FF	year of recording; digits are 4-bit BCD numbers
SERNUM	00000...FFFF	serial number of the recording; digits are 4-bit BCD numbers



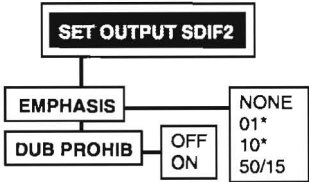
Altering User Data



Selecting SET OUTPUT USER allows you to edit the outgoing User data byte by byte in hex. The Scroll knob and ENTER button are used just as in the symbolic editing menus, except that the arrowed keys in the hex menu move the cursor to the next digit.

Note: Target devices may require, or may not not recognize User Data. This information should be obtained from the device manufacturer.

Altering SDIF-2 Data



Selecting SET OUTPUT SDIF2 allows you to set the state of the emphasis and dub prohibit bits being transmitted on the SDIF-2 interface. To alter either of these settings, press ENTER with the menu item displayed, scroll to the setting you want, then press ENTER again.

Phase Adjustment of SDIF-2 timing references is available under the MISC FUNCTIONS menu.

Each of these functions is accessed exactly as the other menus. Press ENTER to display the first item in the MISC FUNCTIONS submenu, scroll to the item you want, then press ENTER.

Miscellaneous Menu Functions

MISC FUNCTIONS

SDIF2 PHASE ADJ

AUTO MUTE

AES CH A/CH B

CRC ERR

PAR ERR

VLDTY ERR

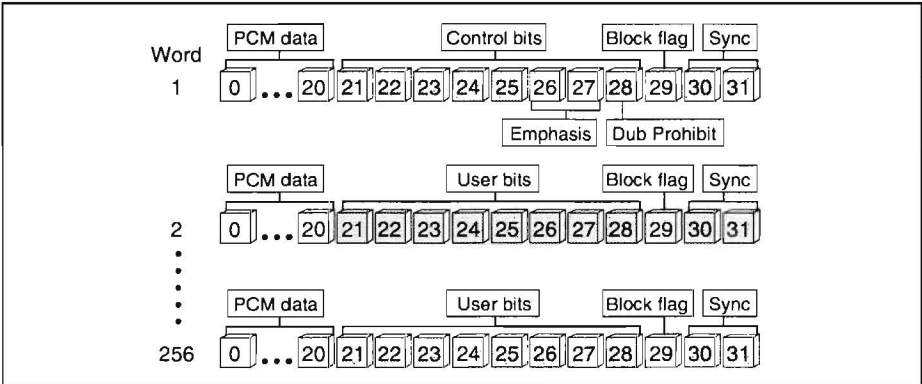
ERROR MODE

DIAGNOSTICS

INIT USER REGS

The SDIF-2 (or Sony 1610) format digital audio interface was originally created by Sony for communication between pieces of its own equipment. There is no published standard for this interface, and the documentation available from Sony does not provide detailed timing information. Consequently, there are often communications problems between pieces of equipment which purport to implement the SDIF-2 interface. The LFI-10 attempts to alleviate some of these problems by allowing adjustment of critical timing parameters.

SDIF PHASE ADJ



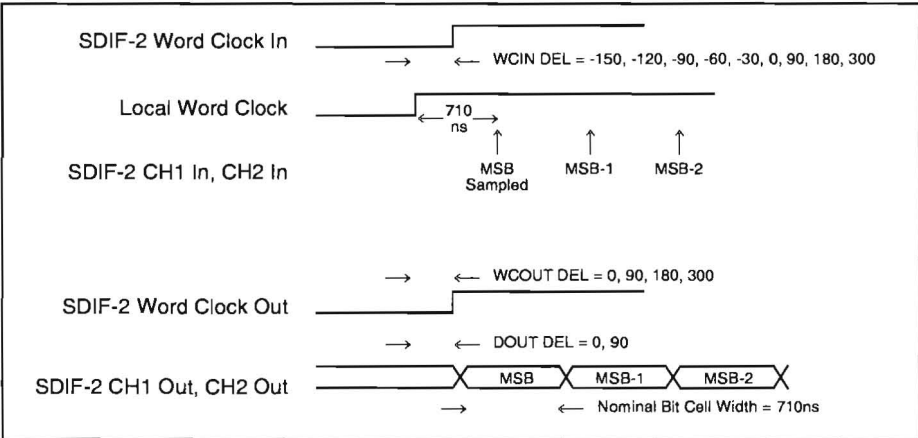
One major point of ambiguity in the Sony interface is the source of the word clock which is used as a framing signal when receiving digital audio data. Since there is a SDIF-2 signal input which is specified as WORD CLOCK IN, many manufacturers assume that this signal is to be used in determining the framing of the digital audio data. However, since there is also a dedicated sync field encoded in the left and right channels of the digital data (as shown above), some manufacturers extract the word clock and framing information directly from the data stream itself and ignore the WORD CLOCK IN signal.

The source chosen for the framing information (either the WORD CLOCK IN signal or the embedded sync information) will determine exactly when the receiving equipment will sample each bit of the digital audio word. Either choice has advantages and disadvantages.

If the WORD CLOCK IN signal is used as the framing source, a problem arises due to the fact that there is no timing specification or tolerance to indicate how much skew is allowed between the start of the word clock signal and the start of the most significant bit (MSB) of the digital audio data. Also, because signals take over a nanosecond to travel through one foot of cable, different length cables between devices can cause significant skews.

If the embedded sync information is chosen as the source for framing of the digital audio data, there is no reason to even include the WORD CLOCK IN signal in the SDIF-2 interface and it is not clear what its purpose is. Also, since there are two channels of digital audio data, there is ambiguity as to which channel to depend on for the framing information. Independent framing of the left and right channels is possible, but would significantly complicate the design of any interface. In addition, some interfaces (such as the Lexicon 480L) do not regenerate the sync field into the outgoing data and, consequently, will not communicate with equipment which requires precise timing of the sync field .

The LFI-10 uses the WORD CLOCK IN signal as the source for its framing information and provides for user adjustment to compensate for timing problems caused by skews between the signals in the SDIF-2 interface.



The LFI-10 has a LOCAL WORD CLOCK which is used as the reference for framing of both receive and transmitted SDIF-2 digital data. This LOCAL WORD CLOCK is phase locked to the SDIF-2 WORD CLOCK IN signal and, nominally, is exactly synchronous with it. The WC IN DEL control (under the MISC FUNCTIONS: SDIF-2 PHASE ADJ menu) allows for slight adjustments of the phase of the LFI-10 LOCAL WORD CLOCK relative to the WORD CLOCK IN signal. This control allows settings from -150 to 300 nanoseconds. A positive WC IN DEL indicates that the LOCAL WORD CLOCK will occur before the WORD CLOCK IN signal. A negative WC IN DEL indicates that the LOCAL WORD CLOCK will be slightly delayed from the WORD CLOCK IN.

If you are experiencing problems receiving digital audio data from an SDIF-2 source, adjusting the WC IN DEL option by trial and error may solve the problem. If the relative phase of the WORD CLOCK IN and the incoming SDIF-2 data are not correct it is possible that the LFI-10 may be attempting to sample the digital audio data at just the time it is changing, resulting in loud digital noise. A more subtle error can occur if the skew between the word clock and data causes the LFI-10 to sample the incoming data during the wrong bit position. This will effectively shift the digital audio data by one bit position, causing a 6dB gain in level of the received signal.

When the LFI-10 transmits SDIF-2 data and word clock, it normally transmits both the WORD CLOCK OUT and the digital data nominally synchronized to its LOCAL WORD CLOCK. The WC OUT DEL control allows you to optionally insert a delay from 0 to 300 nanoseconds before the WORD CLOCK OUT signal. This has the effect of advancing the transmitted digital data relative to the transmitted word clock. Similarly, the DOUT DEL control will delay the digital data out by either 0 or 90 nanoseconds. This will delay the transmitted data relative to the LOCAL WORD CLOCK.

The available settings for the SDIF-2 Phase Adjust controls are:

WC IN DEL	300, 100, 90*, 0, -30, -60, -90, -120, -150
WC OUT DEL	0*, 90, 100, 300
D OUT DEL	0*, 90

Delays are in nanoseconds  
\* default settings

*Problems receiving data from an SDIF-2 source into LFI-10?*  
Turn your volume down. Try adjusting the WC IN DEL submenu. Make sure you check that you are not getting a 6dB gain in level through the box.

*Problems transmitting from the LFI-10 to an SDIF-2 receiver?*  
Turn your volume down. Try playing with WC OUT DEL and DOUT DEL menus. Generally either WC OUT DEL or DOUT DEL should be zero.

The LFI-10 will automatically mute the transmitted audio data to zero if no valid input is detected on the AES data stream. To turn this function ON or OFF, scroll to MISC FUNCTIONS in the main menu and press ENTER. Scroll to AUTO MUTE to see the current setting. Pressing ENTER will cause an arrow to be displayed in front of the setting and will activate scroll knob selection of the alternate setting. Select the setting you want, then press ENTER.

**AUTO MUTE**

The LFI-10 uses only one of the two AES channels to assemble auxiliary data. This control allows you to select the other channel.

**AES CH A/B**

This shows the total number of CRC errors that have occurred since the error was last cleared. Pressing ENTER with this entry displayed will clear the error counter. (This counter is cleared whenever the input signal is removed.)

**CRC ERR**

This shows the total number of Parity errors that have occurred since the error was cleared. Pressing ENTER with this entry displayed will clear the error counter. (This counter is cleared whenever the input signal is removed.)

**PAR ERR**

This shows the total number of Validity errors that have occurred since the error was cleared. Pressing ENTER with this entry displayed will clear the error counter. (This counter is cleared whenever the input signal is removed.)

**VLDTY ERR**



**ERROR MODE** The Error Mode function allows you two choices over the behavior of the front panel error LEDs (CRCC, VALIDITY and PARITY). FLSH (Flash) causes these LEDs to flash whenever an error is detected in the incoming AES or S/PDIF data stream. When you are not available to monitor front panel changes, select MAST (Master) to have the error LEDs stay on once an error has occurred.

**DIAGNOSTICS** Because the Diagnostics in the LFI-10 are extensive, they are covered separately in Chapter 4: Troubleshooting.

**INIT USER REGS** This allows you to clear the user registers, by reinitializing the nonvolatile memory of the LFI-10. When you press ENTER, the display will query:

CNFRM REG RESET?

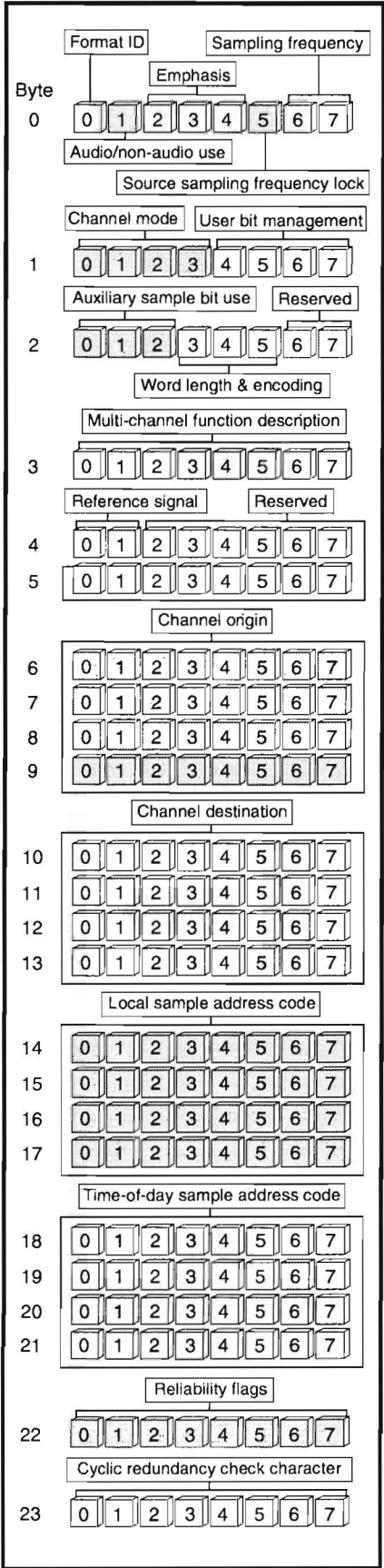
Pressing CANCEL will abort the reinitialization; pressing ENTER will clear the registers and reset them to the factory default settings.

**Store and Recall** The STORE and RECALL buttons are active at all times. When RECALL is pressed, a submenu appears which allows you to select between PRESETS or USER REGS. Pressing ENTER with either of these choices displayed will cause a submenu with the available presets or registers to appear. Scroll to the setup you want to recall and press ENTER. This restores the state of the LFI-10 to the state stored in the preset or register. The state stored in a register contains all the mode information and the settings of the transmit Channel Status and User auxiliary information.

Note: All presets have Channel Status menu items set to their default states, except for the first bit, which determines format.

The LFI-10 has ten user registers available for storing your custom setups. At any time, pressing STORE will display the last register stored — any of the other registers can be accessed with the Scroll knob. Press ENTER to store the current setup in the displayed register. (Any setup previously stored at that location will be erased and replaced with the current setup.)

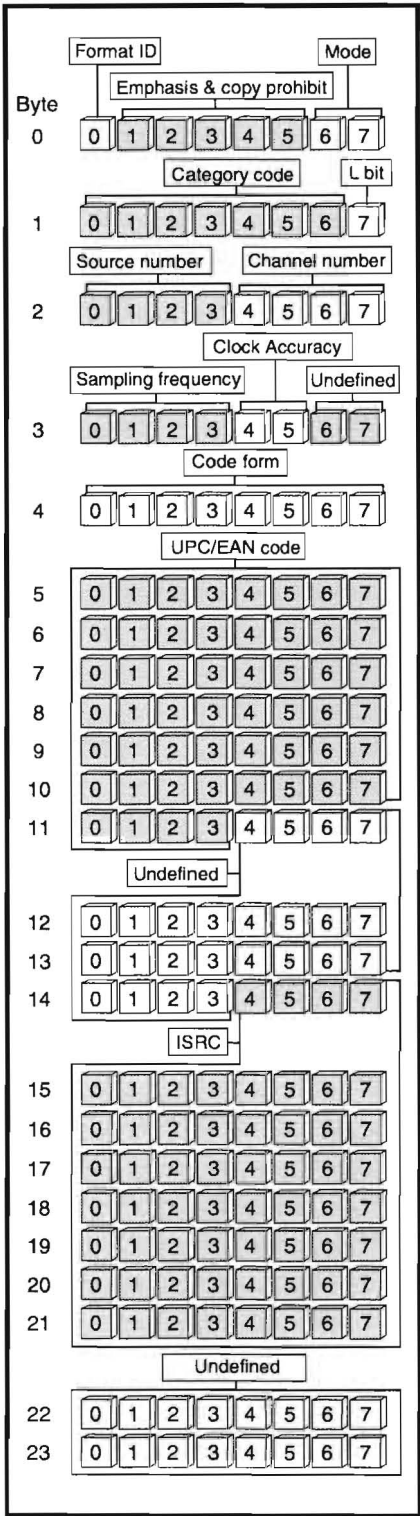
To name a register, press STORE. Use the Scroll knob to select the register you want to rename, then press either of the front-panel arrowed keys. The first character of the current name will flash. Scroll to select a replacement character; use the arrowed keys to move to another character location. When you have entered the name you want, press ENTER.



AES Channel Status Reference  
— Professional Format —

LABEL	BYTE:bit	Defined States	Description
FORMAT ID	0:0	1	identifies block as AES professional format
AUDIO DATA	0:1	0 1	normal audio mode non audio mode
EMPHASIS	0:2-4	000 100 110 111	Emphasis not indicated, rcvr default to no emphasis; manual override enabled no emphasis, manual override disabled 50/15ms emphasis, manual override disabled CCITT J.17 emphasis (w/6.5dB insertion loss at 800Hz)
SIGNAL LOCK	0:5	0 1	default and source sampling frequency locked source sampling frequency unlocked
SAMP FREQ	0:6-7	00 01 10 11	sampling frequency not indicated, rcvr default to 48kHz, manual override enabled 48kHz sampling frequency, manual override disabled 44.1kHz sampling frequency, manual override disabled 32kHz sampling frequency, manual override disabled
MODE	1:0-3	0000 0001 0010 0011 0100	mode not indicated, receiver default to 2-channel mode 2-channel mode, manual override disabled single channel mode (monophonic), manual override disabled primary/secondary mode (channel 1 is primary), manual override disabled stereophonic mode (channel 1 is left channel), manual override disabled
USER BITS	1:4-7	0000 0001 0011	default, no user information indicated 192-bit block structure, preamble "Z" indicates start of block user defined
AUXILIARY SAMPLE BITS	2:0-2	000 001 011	20-bit audio sample word length, use of auxiliary sample bits not defined 24-bit audio sample word length, auxiliary sample bits used for main audio sample data reserved for user defined applications
WD LNTH	2:3-5	000 001 010 011 100 101	word length not indicated word length in bits is 23/19 if maximum word length is 24/20 word length in bits is 22/18 if maximum word length is 24/20 word length in bits is 21/17 if maximum word length is 24/20 word length in bits is 20/16 if maximum word length is 24/20 word length in bits is 24/20 if maximum word length is 24/20
RSRVD	2:6-7		reserved and set to logic "0"
MULTI CH	3:0-7		reserved and set to logic "0"
REF SIG	4:0-1 4:2-7	00 01 10	not a digital audio reference signal (default) grade 1 reference signal grade 2 reference signal reserved and set to logic "0"
RESERVED	5:0-7		reserved and set to logic "0"
CHANNEL ORIGIN	6-9:0-7		alphanumeric channel origin data, first character in message is byte 6, bits 0-7 each byte – ASCII data with no parity bit, LSB first; nonprinted control characters (codes 01-1Fhex and 7F hex) are not permitted, default value is logic "0" (code 00 hex, ASCII null)
CHANNEL DESTINATION	10-13:0-7		alphanumeric channel destination data, first character in message is byte 10, bits 0-7 each byte – ASCII data with no parity bit, LSB first; nonprinted control characters (codes 01-1Fhex and 7F hex) are not permitted, default value is logic "0" (code 00 hex, ASCII null)
LOCAL SAMPLE ADDRESS CODE	14-17:0-7		32-bit binary local sample address code, value is of first sample of current block, bits 0-7 each byte – LSB first, default value is logic "0"
TIME OF DAY SAMPLE ADDRESS CODE	18-21:0-7		23-bit binary time-of-day sample address code, bits 0-7 each byte – LSB first, default value is logic "0"
RELIABILITY FLAGS	22:0-7		data reliability flags; set to 0 (default) if reliable; set to 1 if unreliable, bits 0-3: undefined; bit 4: bytes 0-5; bit 5: bytes 6-13; bit 6: bytes 14-16; bit 7: bytes 18-21
CRCC	23:0-7		conveys information to test valid reception of entire block (bytes0-22)





S/PDIF Channel Status Reference  
— Consumer Format —

LABEL	BYTE:bit	Defined States	Description																																										
FORMAT ID	0:0	1	identifies block as AES consumer format																																										
EMPHASIS & COPY PROHIBIT	0:1-5	0X000 0X100 1X000 X0XXX X1XXX	2 audio channels without pre-emphasis 2 audio channels with 50/15µs pre-emphasis digital (non audio) data digital copy prohibited digital copy permitted																																										
MODE	0:6-7	00	mode 0																																										
CATEGORY CODE	1:0-7	  1000 0000 0100 0000 1100 0000	category code; bits 8(LSB)-15(MSB) 00 00 00 00 2-channel general format, 20 bits/sample max, MSB fixed at position 27 2-channel Compact Disc player 2-channel PCM encoder/decoder 2-channel Digital Audio Tape Recorder																																										
L BIT	1:7	0 1	digital copying prohibited digital copying permitted																																										
SOURCE NUMBER	2:0-3	 0000 1000 0100 1100   1111	source number; bits 16(LSB)-19(MSB) don't care 1 2 3   15																																										
CHANNEL	2:4-7	 0000 1000 0100 1100   1111	channel number (audio channel); bits 20(LSB)-23(MSB) don't care A (left channel for 2-channel format) B (right channel for 2-channel format) C   O																																										
SAMP FREQ	3:0-3	0000 0100 1100	44.1kHz sampling frequency 48kHz sampling frequency 32kHz sampling frequency																																										
CLOCK ACCURACY	3:4-5	00  01   10	level II; normal accuracy mode; all receivers should receive a signal of +1000x10 <sup>-6</sup> of nominal sampling frequency level III; variable pitch shifted clock mode (for specially designed receivers) level I; high accuracy mode; tolerance of transmitted sampling frequency +50x10 <sup>-6</sup>																																										
UNDEFINED	3:6-7		undefined																																										
CODE FORM	4:0-7	  1XXX XXX	bits 32(MSB)-39(LSB) UPC/EAN, ISRC coding mode																																										
UPC/EAN CODE	5-10:0-7, 11:4-7		catalog number of the program software expressed in 13 digits; BCD(N1-N13)																																										
UNDEFINED	12-13:0-7, 14:0-3		undefined																																										
ISRC	14:4-7, 15-21:0-7		12-character ISRC code characters 1-2 : country code (6 bits each character as per table) characters 3-5: owner code (6 bits each character as per table) characters 6-7: year of recording; digits are 4-bit BCD numbers characters 8-12: serial number of the recording; digits are 4-bit BCD numbers  bit organization: byte 14, bits 4-7, bytes 15-17, bits 0-7 and byte 18, bits 0-1 = country and owners codes; byte 18, bits 2-3 are undefined; byte 18, bits 4-7 and bytes 19-21, bits 0-7 = year and ser #																																										
<table><tr><th colspan="6">Coding Table</th></tr><tr><td>0 000000</td><td>6 000110</td><td>C 010011</td><td>I 011001</td><td>O 011111</td><td>U 100101</td></tr><tr><td>1 000001</td><td>7 000111</td><td>D 010100</td><td>J 011010</td><td>P 100000</td><td>V 100110</td></tr><tr><td>2 000010</td><td>8 001000</td><td>E 010101</td><td>K 011011</td><td>Q 100001</td><td>W 100111</td></tr><tr><td>3 000011</td><td>9 001001</td><td>F 010110</td><td>L 011100</td><td>R 100010</td><td>X 101000</td></tr><tr><td>4 000100</td><td>A 010001</td><td>G 010111</td><td>M 011101</td><td>S 100011</td><td>Y 101001</td></tr><tr><td>5 000101</td><td>B 010010</td><td>H 011000</td><td>N 011110</td><td>T 100100</td><td>Z 101010</td></tr></table>				Coding Table						0 000000	6 000110	C 010011	I 011001	O 011111	U 100101	1 000001	7 000111	D 010100	J 011010	P 100000	V 100110	2 000010	8 001000	E 010101	K 011011	Q 100001	W 100111	3 000011	9 001001	F 010110	L 011100	R 100010	X 101000	4 000100	A 010001	G 010111	M 011101	S 100011	Y 101001	5 000101	B 010010	H 011000	N 011110	T 100100	Z 101010
Coding Table																																													
0 000000	6 000110	C 010011	I 011001	O 011111	U 100101																																								
1 000001	7 000111	D 010100	J 011010	P 100000	V 100110																																								
2 000010	8 001000	E 010101	K 011011	Q 100001	W 100111																																								
3 000011	9 001001	F 010110	L 011100	R 100010	X 101000																																								
4 000100	A 010001	G 010111	M 011101	S 100011	Y 101001																																								
5 000101	B 010010	H 011000	N 011110	T 100100	Z 101010																																								
UNDEFINED	22-23:0-7		undefined																																										

All other bit states are undefined and/or reserved as of this writing. This information is not to be considered as a substitute for reference to current and future published standards.

This chapter is intended primarily to help you to recognize some common error states which can be diagnosed or corrected from the LFI-10 front panel controls, or by simple means such as cable replacement. Any error states which are not covered here should be referred to Lexicon Customer Service.

In a low voltage, or "brown-out" condition, the LFI-10 will freeze in its current state. None of the controls will have any effect. When power returns to a normal level, the unit will reset itself as though it had just been powered on. After the initial power up display message, the unit will return itself to the state it was in when the power dropped. If the unit does not reset itself, turn the power OFF, then ON to resume normal operation.

## Low Voltage

Temperature extremes may cause the LFI-10 to exhibit unpredictable behavior. If the unit has been subjected to temperatures below 32°F (0°C) or above 95°F (35°), it should be turned off and allowed to return to normal temperature before use. The unit may be damaged by exposure to temperatures below -22°F (-30°C) or above 167°F (75°), or by exposure to humidity in excess of 95%. If a unit exposed to such conditions fails to operate after it returns to a normal operating temperature, contact Lexicon Customer Service.

## Overheating

Following are some of the problems that may occur due to errors in setup or operation of the LFI-10. Whenever operational problems occur, carefully check your entire setup. Verify that all connected equipment is operational, and that all cables are in good condition and connected properly. Refer to Chapter 3 for hookup examples. Review the LFI-10 input and output settings to be sure that they match your particular setup.

## Solving Problems

### **The menu display and front panel indicators do not light when power is turned on.**

Check line cord to ensure good connection to the AC outlet and to the receptacle on the LFI-10 rear panel. If the problem is not in the cord or the connections, the LFI-10 internal fuse may be blown. Refer the unit to qualified service personnel for fuse replacement.

### **Signal Lock and Signal Present are not indicated on the front panel LEDs.**

If your input is SDIF-2, this is not an error state. These indicators are enabled only with AES/EBU or S/PDIF inputs, to eliminate confusion with SDIF-2 input in bidirectional modes.

### **Connected digital audio devices will not accept the signal transmitted by the LFI-10.**

Check to make sure that any device receiving data from the LFI-10 is set up as a slave. If the receiver is a consumer device, check to make sure that S/PDIF output is selected at the LFI-10 front panel. Verify that the master device is transmitting data and that data is being received by the LFI-10.



**The AES/EBU output of a master device is hooked up to the LFI-10, but Signal Lock and Signal Present indicators on the LFI-10 front panel do not light.**

Check to make sure that the LFI-10 front panel Input selection matches the type of connector used. Check also to make sure that the LFI-10 front panel CLOCK is set for AES type. Check cables for shorts or bad connections.

**The LFI-10 is transmitting an S/PDIF signal to a DAT machine's S/PDIF input. The DAT machine will not go into Record mode.**

Check to make sure that Copy Prohibit is disabled on the LFI-10 menu. From the main menu, use the Scroll knob to select SET OUTPUT CS and press ENTER. Scroll to EDIT CS CONS SYM and press ENTER. Scroll to COPY PROHIB. If Copy Prohibit is enabled, the display will read COPY PROHIB YES. Press ENTER to activate Scroll knob selection of NO, then press ENTER to activate your selection.

Note that some DAT machines will not permit recording of a digital source with a 44.1kHz sampling frequency from the S/PDIF input. The master device sampling frequency should be 48kHz. Alternatively, to record at 44.1kHz, select AES/EBU as the LFI-10 output and hook up to the AES/EBU input of the DAT machine.

**The LFI-10 output has a gain of +6dB over the SDIF-2 input . . . or the LFI-10 output consists only of noise.**

SDIF2 PHASE ADJUST needs to be corrected. Turn down the volume of any monitoring device during SDIF-2 Phase Adjustment. From the main menu, use the Scroll knob to select MISC FUNCTIONS and press ENTER. Scroll to SDIF2 PHASE ADJ and press ENTER. Experiment with different settings of WC IN DELAY, WC OUT DELAY and DATA OUT DELAY to correct the output.

**The LFI-10 CRCC Error indicator is flashing. Is the LFI-10 receiving errors?**

Not necessarily, some professional digital audio equipment do not fully implement the AES standard, which requires transmission of CRC data. To check this, use the Scroll knob to select VIEW INPUT CS from the main menu. Press ENTER. Scroll to VIEW CS SYM and press ENTER. Scroll to CRC RD at the bottom of the menu. If the displayed value is zero, your equipment is not transmitting CRC data, and the flashing of the LFI-10 front panel CRCC indicator can be ignored.

**A 480L is connected to the LFI-10 480L Interface connector, and a DAT machine is connected to the LFI-10 BNC SDIF-2 connectors. Neither the 480L nor the DAT machine seem to be working properly.**

Both the 480L interface connector and the BNCs are SDIF-2 I/Os wired in parallel in the LFI-10. The LFI-10 will only accept one SDIF-2 input. If you want the 480L to remain in the loop, disconnect the DAT machine from the LFI-10 SDIF-2 BNCs and try using the DAT machine with the LFI-10 AES/EBU or S/PDIF connectors in bidirectional mode.

Routine Maintenance

The LFI-10 requires minimal maintenance. Use a soft lint-free cloth slightly dampened with warm water and a mild detergent to clean the exterior surfaces of the unit.

**Do not use alcohol, benzene or acetone-based cleaners  
or any strong commercial cleaners.**

Avoid using any abrasive materials such as steel wool or metal polish. If the unit is exposed to a dusty environment, a vacuum or *low-pressure* blower may be used to remove dust from the LFI-10's exterior.

**DO NOT, UNDER ANY CIRCUMSTANCES, OPEN THE UNIT.  
DOING SO WILL VOID YOUR WARRANTY,  
AND MODIFICATIONS MAY RENDER THE UNIT UNSERVICEABLE.**

Diagnostics

**CAUTION:**  
**Some of these tests will reinitialize the unit,  
causing all User Registers to be erased.**

The LFI-10 diagnostics were developed primarily as an aid in testing and servicing the LFI-10. They are briefly described here for reference in the event that your unit requires service. These tests should only be run after consultation with Lexicon Customer Service.

Note: Selecting DIAGNOSTICS from the LFI-10 main menu causes the system to reboot. Once in Diagnostics mode, the CANCEL key will step back only through the Diagnostics menu items, it will not return you to the main menu, as in normal operating mode. To exit Diagnostics mode, you must scroll to the last Diagnostic menu item (EXIT DIAG -> ENTER), then press ENTER.

To enter Diagnostics mode, Scroll to MISC FUNCTIONS in the main menu. Press ENTER. Scroll to DIAGNOSTICS and press ENTER. The display will show the label "DIAGNOSTICS -->", indicating that the system has rebooted in Diagnostics mode. Turning the Scroll knob displays each of the Diagnostics menu items. As with the normal operating system, pressing ENTER will select an item, and pressing ENTER will activate your menu selection. Pressing CANCEL will halt the current test, or step you back one level through the Diagnostics menu. Note that while tests are running, most front panel keys are inactive.

The Diagnostics menu selections are listed here for reference. A brief description of each test follows.

- |                   |   |
|-------------------|---|
| SYSTEM SCREENING: | PRE-BURN IN • POST-BURN IN                      |
| MODE/STATUS:      | TEST STATUS • LOOP ON TEST                      |
|                   | SLV COM MONITOR                                 |
| HOST TESTS:       | STATIC RAM TEST • REGISTER INIT • REGISTER TEST |
|                   | ROM TEST  |
| FRONT PANL TESTS: | FIP BURN IN • LED TEST • SWITCH TEST •          |
|                   | FIP CHAR TEST • FIP BLOCK TEST                  |
| SLAVE STATUS:     | SAMP • PARITY • VLDTY • CRCNT • CRC • STAT      |
| RS232 LOOPBACK    |   |
| DIG AUDIO TESTS:  | AUDIO LOOP • CS LOOP • USER LOOP • CONNECTORS   |
|                   | SDIF-2 READ/WRITE                               |

**SYSTEM SCREENING**

EXIT DIAG -> ENTER  
Selection of SYSTEM SCREENING (PRE or POST BURN IN) initiates the following series of tests:

- |                                  |                                    |
|----------------------------------|------------------------------------|
| REGISTER INIT (PRE BURN IN only) | USER LOOP                          |
| STATIC RAM TEST                  | CONNECTORS                         |
| AUDIO LOOP                       | RS232 LOOPBACK                     |
| CS LOOP                          | REGISTER CHECK (POST BURN IN only) |

These tests are used by Lexicon during the testing phase of the unit. PRE BURN IN is run to determine proper functionality of the unit prior to a 48-hour burn in cycle, after which POST BURN IN is run as a second verification of functionality. All of the tests except RS232 LOOPBACK will halt on failure and go on to the next test. Pressing CANCEL at any time during the screening process will abort the current test and go on to the next test. The results of each test are logged in MODE/STATUS: test status. The status for the PRE and POST burn tests indicate the overall result of the screening (i.e. all tests PASSED or one or more tests FAILED). If the status indicates that the screening FAILED, the failed test(s) status should be checked.

**MODE / STATUS**

**Test Status**

This allows the operator to check the status of the diagnostic tests shown below.

- REGISTER INIT
- STATIC RAM TEST
- AUDIO LOOP
- CS LOOP
- USER LOOP
- CONNECTOR
- RS232 LOOPBACK
- REGISTER CHECK
- PRE-BURN IN
- POST-BURN IN

Note that if a reinitialization is performed, all test status settings are set to UNTESTED. This status is updated again when these tests are run. Status is shown as:

- UNTESTED: The test has not been run (since reinitialization).
- PASS: Test successfully completed.
- FAIL: Test failure.
- ABORTED: The operator aborted the test by pressing CANCEL while the test was running.

**Loop On Test**

This is a special troubleshooting mode that allows a single test to be continuously run to help detect intermittent problems. Each time the ENTER key is pressed the mode toggles with a brief flash of the current mode on the display. Test failure causes the loop to halt and the failure to be logged in Test Status.

**Slv Com Monitor**

The slave communications monitor mode is a special facility that echoes all communications from the Host and the Slave processors to the COMM port. Communication monitoring requires connection between the RS232 serial port of a computer terminal or PC running a terminal program and the LFI-10 COMM port. Enabling this mode will interfere with remote COMM functions.



HOST TESTS

Static RAM Test

The Static RAM test checks 5887 bytes of the Host’s static RAM (8000 bytes total).The untested portion of RAM allows the unit to continue functioning without crashing during testing. If a failure occurs, status information is made available for analysis at the COMM port.

Register Init

This is the first of a series of tests of the nonvolatile portions of the Host processor’s static RAM. Checksum calculation results are stored in system memory and are also available at the COMM port.

Register Check

This test is similar to Register Init, but additionally reports any mismatch with the checksum results of the previous test. Note that initializing the user registers, loading a preset or user registers or storing a register will cause this test to fail.

ROM Test

This test calculates the checksum of the diagnostic portion of the Host ROM. Results are displayed and sent to the COMM port.

FRONT PANEL TESTS

FIP Burn In

This function cycles all of the display elements on and off indefinitely to allow cycling of display elements during burn in. Press CANCEL to exit the test.

LED Test

The LED test allows individual testing of each of the LFI-10 front panel LEDs. When the test is started all of the LEDs are turned off except the SIG. LOCK LED. Turning the Scroll knob turns this LED off and lights another. Note that the scroll knob must be turned slowly; turning the knob too quickly will skip

over LEDs. The following list indicates the LED ON/OFF sequence:

- |                       |                         |
|-----------------------|-------------------------|
| 1. SIG.LOCK           | 12. 44.1kHz             |
| 2. SIG.PRES           | 13. 44.056kHz           |
| 3. XLR (in)           | 14. 32kHz               |
| 4. RCA (in)           | 15. AES/EBU             |
| 5. OPT (in)           | 16. S/PDIF              |
| 6. SDIF-2 (in)        | 17. SDIF-2 (key LED)    |
| 7. AES TYPE (clock)   | 18. CLOCK (key LED)     |
| 8. SDIF-2 (clock)     | 19. CRCC                |
| 9. COPY PROHIBIT (in) | 20. VALIDITY            |
| 10. EMPHASIS (in)     | 21. PARITY              |
| 11. 48kHz             | 22. MUTE                |
|                       | 23. COPY PROHIBIT (out) |
|                       | 24. EMPHASIS (out)      |
|                       | 25. AES/EBU (out)       |
|                       | 26. S/PDIF (out)        |
| 27. LOOP THRU         |                         |

Switch Test

This test verifies the operation of the LFI-10 front panel switches. When run, the test displays an assigned switch number, function and press or release status of each switch pressed. The CANCEL key switch number is displayed along with “CANCEL”. Pressing CANCEL exits the test and returns you to the front panel Test menu, so, if you want to test all switches, press CANCEL last.



(There will be a delay of several seconds before the exit is performed.)

#### **FIP Char Test**

This test displays a single character on all of the FIP display elements. The character displayed can be changed by turning the Scroll knob. All of the letters in the alphabet are available. This allows the operator to easily identify display problems.

#### **FIP Block Test**

This test turns on all elements of a single display segment with all other segments off. The Scroll knob shifts the lit segment left or right. This test is used in conjunction with the previous test to identify display problems.

### **SLAVE STATUS**

The Slave Status menu provides access to status information sent by the slave to the Host, which uses it to calculate displays and set modes.

#### **Samp**

The SAMP 0 and SAMP 1 items are a count of the number of samples received over a period of about 123ms. The LFI-10 uses this information to calculate the sample rate of incoming digital audio. The data is represented in hex with SAMP 0 holding the low byte and SAMP 1 holding the high byte. The sample frequency can be determined by multiplying the count by 8.138. (Note that 8.138 is a truncated multiplier and the result may not be exact.)

e.g. - SAMP 0 = 0A, SAMP 1 = 17, 170A hex -> 5898 dec x 8.138 ≈ 48,000 (47,184)

#### **Parity**

The PARITY0 and PARITY1 items are an ongoing count of parity errors. The count is reset on power up and wraps around to 00 when 0xFFFF is exceeded. PARITY0 contains the low byte and PARITY1 contains the high byte, represented in hex. Note that this count is used to update the count available in the MISC FUNCTIONS menu. That count, however, gets reset to zero when a new input is selected using this count to increment the displayed count.

#### **Validity**

The VLDTY 0 and VLDTY 1 items are an ongoing count of validity errors. The count is reset on power up and wraps around to 00 when 0xFFFF is exceeded. VLDTY 0 contains the low byte and VLDTY 1 contains the high byte, both represented in hex. Note that this count is used to update the count under the MISC menu. That count, however, gets reset to zero when a new input is selected using this count to increment the displayed count.

#### **CRCNT**

The CRCNT 0 and CRCNT 1 items are an ongoing count of CRC errors. The count is reset on power up and wraps around to 00 when 0xFFFF is exceeded. CRCNT 0 contains the low byte and CRCNT 1 contains the high byte, both represented in hex. Note that this count is used to update the count under the MISC menu. That count, however, gets reset to zero when a new input is selected using this count to increment the displayed count.

#### **CRC**

This field displays the CRC as calculated by the LFI-10. If the unit feeding the LFI-10 is calculating CRC properly, this should match the value in byte 23 of the Channel Status block.

Note: These values will not always be the same. If the output format selected

is AES/EBU, the transmitted CRC is calculated from the data in the SET OUTPUT CS menu. In LOOP-THRU mode, CRC is passed unchanged from input to output.

**STAT**

The STAT 0 and STAT 1 items contain additional Slave status information embedded in the bit patterns of the data.

**RS232 LOOPBACK TEST**

This tests the LFI-10's ability to write to and read from the rear panel COMM port.

**DIGITAL AUDIO TESTS**

The digital audio tests provide a means of checking the hardware related to the digital audio inputs and outputs of an LFI-10. None of the tests require external equipment except for the SDIF-2 interface tests, which require a second LFI-10. Note that these tests do require wrap around cables to feed outputs back to inputs. Refer to each section for the specific requirements of each test.

**Audio Loop**

This test checks the portions of the LFI-10 circuitry that pass audio data. A balanced cable with a male XLR on one end and a female XLR on the other end is required for this test. This cable is connected from the DO to the DI.

**CS Loop**

The Channel Status loop test checks the ability of the LFI-10 to transmit and receive channel status information properly. The test displays the byte being tested and the value (in decimal). Status regarding test failures are reported at the COMM port. A balanced cable with a male XLR on one end and a female XLR on the other end is required for this test. This cable is connected from the DO to the DI.

**User Loop**

This test is similar to the CS Loop test, but checks the ability of the LFI-10 to send and receive user bit data in the AES data stream.

**Connectors Test**

This test verifies the operation of the three AES-type data connectors on the LFI-10: (XLR, RCA and OPTICAL). Status regarding test failures are reported at the COMM port. A balanced cable with a male XLR on one end and a female XLR on the other end, a cable with RCA connector on each end and an optical cable are required for this test. These cables are connected from the appropriate DO to the DI.

**SDIF-2 Tests**

These tests ( SDIF-2 Write and SDIF-2 READ) provide for accurately testing the LFI-10 SDIF-2 interface, but require a second LFI-10 unit.

**Slave Processor Diagnostics**

These consist of a series of power up tests. Status regarding test results are available at the COMM port. The test series is as follows:

ROM Test

RAM Tests: data test, address test

**Host Processor Power Up Diagnostics**

This test is performed on all memory except the nonvolatile areas.



Digital Audio  
Inputs and Outputs

AES, S/PDIF: XLR, 3-wire balanced  
RCA, 2-wire  
unbalanced coaxial line  
Optical, optical fiber  
SDIF-2: BNC, 75Ω, unbalanced

Memory

7 presets with 10 user registers  
available

Status Indicators

Signal Present  
Signal Lock  
Input connector selection  
Clock selection  
Copy Prohibit (incoming AES data)  
Emphasis (incoming AES data)  
Input sample rate  
Input format  
CRC Error  
Validity Error  
Parity Error  
Mute  
Copy Prohibit (outgoing AES data)  
Emphasis (outgoing AES data)  
Output format selection

Front Panel Display

One line of 16 alphanumeric characters,  
FIP display

Front Panel Controls

SDIF-2 Select  
Input Select  
Clock Select  
Output Select  
Scroll knob: used for selecting  
menu displays  
Arrowed keys: used for selecting  
menu displays  
Enter  
Cancel  
Store  
Recall  
Power Switch

RFI Shielding

Complies with FCC Rules Part 15  
Class A requirements for computer  
equipment

Safety Approvals

UL-1419

Power Requirements

100/120/220/240 VAC (+5%, -10%)  
50-60 Hz 25W

Dimensions

19.0"W x 1.75"H x 13.9"D  
(483 x 45 x 353mm)  
Conforms to 19" rack mount  
standard, 1U high

Weight

11 lbs 3 oz (5.1 kg)  
Shipping materials meet or exceed Project 1A of the National Safe Transit Association (NSTA) packaged-product specifications: vibration test, drop test, static compression test.

Environment

Operating Temperature: 32° to 95°F (0° to 35° C)  
Storage Temperature: -22° to 167°F (-30° to 75°C)  
Humidity: 95% maximum without condensation

Specifications subject to change without notice.







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Lexicon Part No. 070-08618 Rev 1

Printed in U.S.A.